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WAR MEDICINE SURGERY & HYGIENE

RESEARCH SOCIETY REPORTS

THE SIXTH SESSION OF THE AMERICAN RESEARCH SOCIETY
Hotel Continental, May 17 and 18, 1918

Major Walter B. Cannon, Chairman of the Research Committee of the A. R. C., presided throughout the session The subject of the first meeting of the session was Military Orthopedics.

MILITARY ORTHOPEDICS

The Place of Orthopedic Surgery in an Army Organization. Major JOEL E. GOLDTHWAITE, M. R. C., Senior Consultant in Orthopedic Surgery, read a paper in which he stated that the work of the Division of Orthopedic Surgery in the medical organization of the army divides itself clearly into two parts, one concerned with preparing men for combat and the other with assisting in their recovery if wounded.

Pre-Combat Orthopedic Work.

a) This involves : —

1. Instruction in the proper use of the body in standing, walking, or other activities, so that there is the least possible waste of energy or liability to over-strain in the performance of regular duties.

2. Special training, by means of drills, orthopedic exercises, etc., to overcome bad habits of carriage or body use.

3. Instruction in the care of the feet.

4. Instruction of the stretcher bearers in the use of standardized splints for transport of the wounded.

b) Great numbers of men are " scrapped " from the army not because they are sick but because of symptoms which have developed from wrong usage of the body. Once the bad habits are overcome, foot weakness and back strain (the most common results of postural

defects) will disappear, for such conditions represent weakness and not disease. Treatment must be carried out on a group basis, so that large numbers can be cared for simultaneously.

Special Training Battalion. Men with specially troublesome feet, weak backs, general bad posture, lack of endurance, etc. are sent to this battalion for training. Every minute of the time the fully erect, alert position of the body is emphasized, while every movement involved in special tasks is made from the alert or " attention " position. Four companies have been established in the battalion, with programs of increasingly difficult planning so that the schedule of the fourth company is only slightly below that required for full combat fitness. Before the final discharge is made the men must demonstrate by involuntary use of the body that the corrected habits of posture have become automatic. With the methods adopted most of the men can not only be saved for the army but between 70 o/o and 80 o/o of them can be made fit for full combat duty.

Much of the time of the representatives of the Division of Orthopedic Surgery has been occupied in supervising the shoeing of the army. If the common pronation or inward sag of the ankle can be corrected by raising the inner edge of the heel, the normal strength is regained. With markedly spread feet the use of figure-of-eight marching straps, together with the raised inner edge of the heel, gradually draws the foot together and normal tone ultimately results. For the men of the Special Training Battalion, a shop has been established where 100 pairs of shoes can be balanced in a day and in which the necessary leather foot straps can be made.

When the men are ready for combat it is important to see that the least possible injury results from wounds which may be received. To lessen the risk of careless or incompetent handling in the transport to hospital the Chief Surgeon has adopted a standardized set of splints for the army, and the instruction of the stretcher bearers and ambulance corps men in their use has become part of the work of the Orthopedic Division.

Post-Combat Period.

A most perfect surgical result in the Advanced Zone may become a very poor functional result unless proper supervision and direction of the case is assured to the man when he is sent to the rear. To meet the needs of these cases, special hospitals are being organized in the rear where the work will be performed partly by orthopedic surgeons and partly by general surgeons interested in orthopedics and desiring assignment to that branch. Not only will there be the usual methods for the rapid restoration of func-

tion, but curative workshops will also form part of the equipment of these hospitals. All cases of major amputation will be sent there for appropriate treatment to prevent the common contractures of the joint above the stump, and there also the temporary artificial limbs will be fitted with the idea of encouraging function at the earliest possible moment.

It is obvious that the work of the Orthopedic Division helps the men as individuals as well as saving them for the army. The preliminary training with the better habits of carriage makes for better general health, and the physical training which insists upon alertness of body also results in much greater alertness of mind. In regard to the post-combat work, a man with an artificial leg may be just as useful for office work or other inactive service for the army as a man with two normal legs, and if he is made to realize that he need not be " scrapped " but is recognised as of use his *morale* is preserved and a standard set that will be carried into civil life. The work, therefore, while primarily military, is at the same time most broadly humanitarian and represents a square deal to the man who has played squarely to the nation.

The Development of Military Orthopedie Surgery under Colonel Sir Robert Jones. Major ROBERT B. OSGOOD, M. R. C., Consultant in Orthopedic Surgery, A. E. F., presented a paper in which he expressed regret that Colonel Sir Robert Jones could not be present to tell the " almost romantic " story of British military orthopedic surgery as it had developed under his leadership. At the beginning of the war the need for orthopedic centers was only vaguely conceived, even by Sir Robert himself. He was placed in charge of a military hospital for bone and joint cases at Alder Hey near Liverpool, but soon after was given the title of Inspector of Military Orthopedics and took the first steps towards the creation of a bone and joint centre at Shepherd's Bush (London), to be developed as the need for special care and treatment in these cases and their increasing number and importance became manifest. The Liverpool and London centers are to-day the most influential and among the largest of the orthopedic hospitals.

The necessity for providing a large number of beds in Great Britain for soldiers more or less crippled arose from three main causes : —

1st. The inevitable maiming which gun-shot wounds themselves caused as a result of serious damage to joint structures, loss of substance of bone and muscle tissue, and complete severance or loss of conductivity of the peripheral nerves.

2nd. The secondary changes in bone, muscle, and nerve tissue, which resulted from the universal infections occurring in these wounds in the early part of the war.

3rd. The lack of preventive treatment accorded these cases before and after they reached the General Home Hospital.

The definition of what constituted an orthopedic case was made very broad and inclusive. It covered mal-united and ununited fractures, all femoral fractures, old injuries to nerves, cases needing muscle transplantation, those requiring special surgical appliances (including artificial limbs), and, in general, all deformities of bones and joints.

To deal with these conditions many new centres were established, while the old ones increased their number of beds or took over whole hospital plants. Necessary operations represented only a part of the activity of these centres. Departments of massage, electrical and hydrotherapeutic treatment were organized and equipped with trained lay and medical personnel and with complicated and expensive apparatus.

It soon became evident that curative occupation was almost an essential for the speedy recovery of these groups of discouraged men; it also aided in maintaining discipline, and men who had constantly evaded rules began to obey them, those who had overstayed their leave and returned drunk came back on time and sober, while those who had refused operations, calculated to give them more function, sought them. Workshops became a helpful part of every center.

Present Organization. The commanding officer of the hospitals in which these centers are situated is in direct charge of their administration, passing up through the A. D. M. S. and the D. D. M. S. to the Director General of Medical Services. The professional work is in charge of an orthopedic surgeon or a general surgeon especially interested in bone and joint work. In direct connection with each hospital is a consulting surgeon, to whom the staff have direct approach, and who may take matters up with the Inspector of Orthopedic Surgery, Sir Robert Jones, or other officers. Reports show that from 75 to 85 per cent. of the men are returned to the army in one category or another — an unexpectedly high percentage in view of the type of cases.

Further development. The necessity of standardized splinting at the earliest possible moment has become evident. The front line splint drills have been adopted in most of the British armies; they are recognized as pain saving, shock preventing, and even life saving measures. Both the French and British realize that the estab-

lishment of special centers for the treatment of fractures is essential, and the Americans must do the same. In amputated cases, weight bearing must begin at the earliest possible moment that the condition of the stump will allow. It is better for the physical condition of the stump and the mental condition of the soldier, and prevents the muscular contraction which makes later fitting of apparatus impossible until it is overcome. Experience has shown that from one-third to one-half of the ordinary deformities resulting from gun-shot wounds are preventable. Though the ability to exercise preventive measures is never a question of minutes it is often a question of a few days. There is a psychological moment in convalescence when the soft callus of a bowing bone is mouldable to proper alignment, when a contracting joint may be gradually and safely straightened without suffering or operation. The demand for speedy evacuation from the temporary hospitals where the greater part of the surgery is done focuses attention on the immediate results. The surgeons upon whom, in the various later stages of convalescence, the care of the case devolves, feel a certain lack of responsibility for the functional result of the first operation, and devote their chief attention to the general condition of the patient and the healing of his wound, since the pressure for beds in these general hospitals is only slightly less than in the front lines.

Surgeons must free themselves from their tendency to treat the *wounds* and forget the *function*; to make a *well* man but not a *working* one; to take the anatomical rather than the physiological point of view.

Report on the Military and Medical Organization of the Reeducation Centers for soldiers Evacuated from the Front. Médecin-Major CHEVALLIER read a paper describing the French orthopedic organization and commenting on the American.

On leaving hospitals or physiotherapeutic dépôts, or on returning from sick leave, soldiers who are suffering from difficulties in function consequent upon lesions of the articulations, adherent scar tissue, muscular atrophy, rheumatism, etc., as well as those who are suffering from depression or general fatigue, must go through a course of re-education if they are to regain as quickly as possible their moral and physical health. This object is attained in the French army by different methods accordingly as the men have been wounded or ill.

Category C' consists of men who have functional difficulties

which necessitate the application of special methods of physical reeducation.

Category C^2 comprises men who are in too delicate health generally to be able to carry out immediately the course of exercises designed for the higher category.

For Category C^1 there is special apparatus, such as counterpoised machines for flexion and extension, inclined planes for progressive working of the joints of the lower limbs, various devices for strengthening the wrist and fingers. These patients also perform general physical exercises requiring moderate effort. Military instruction is reduced to the minimum.

Category C^2 are required to march from 4 to 8 kilometres, with equipment but no knapsack. The men go through educative exercises and games arranged for walking, climbing, jumping, lifting, etc. Each lesson is interrupted by frequent breathing exercises, for many of the men have suffered from chest affections or gas poisoning.

Category C^3, into which the other two merge on improvement, undertakes marches of from 8 to 15 kilometres, with equipment and increasingly heavy knapsack.

The program of re-education is established every fortnight, in equal stages; at the end of each the men are examined and either maintained in their category, passed to the higher one, or removed altogether as unfit.

By these means the number of unfit men in the French army has in the space of a few months, been reduced by five-sixths.

Dr Chevallier expressed his appreciation of the work done at the Orthopedic Centre of the American army. Deformities of the feet, after having been carefully classified,are there corrected by straightening arrangements in the boots and special exercises. Each man has two pairs of boots which he changes every alternate day. The boot is always an inch longer than the wearer's foot, if correction of hammer toes is necessary. The straightening process is carried out by means of strips of leather placed transversely under the sole and behind the tuberosity when there is crowding of the metatarsus. If there is treading over on the outside of the foot the heel is raised progressively from the inside edge to the outside, and *vice versa*. Deformities of the sole under the instep are corrected by little bridges. Turned-out feet are treated by walking exercises with the toes turned in.

The results obtained are so interesting that, in Dr. Chevallier's opinion, such orthopedic centres are indispensable to every army.

The role of the Orthopedist in the Spontaneous Foot Troubles Displayed by Soldiers on active Service. Professor FRÖHLICH, of the University of Nancy, read a paper describing the minor diseases of the foot and their treatment. He believed that except in rare instances of serious complications it was inadvisable to operate, as all such troubles were compatible with active service, or at least with the auxiliary services, and it was unnecessary to incur the long convalescence entailed by surgical treatment.

Uncomplicated flat foot. The ordinary army boot should be fitted with an entire sole made of cork and with the inside edge raised. The inner side of the heel should also be higher than the outer.

Valgus, or weak ankle. This is often due to a faulty synergy between the muscles of the leg or tibia and those of the fibula. It may be corrected by walking on the outside of the foot with the toes turned in.

Arched foot. For an excessively high instep a square-toed boot with raised toecap may be worn. The sole should be sufficiently hollowed to accommodate the back of the heel, but care must be taken to see that the anterior lip of the hollow does not fill in the whole of the vault of the foot. The thickened tissues of the sole must be treated by ablation in oblique layers without previous softening by liquids, and protection of the painful part by corn-plaster.

Congenital club foot. In men presenting themselves for military service this will have been already treated in infancy. When a slight deviation persists, a boot should be used which fixes the foot firmly in a slightly varus position: it should have a cork sole and the heel should be raised a little inside.

Hallux Valgus needs wide boots with accommodation inside for the protruding first metatarso-phalangeal articulation. A piece of cotton may be placed between the first and second toes to separate them and the bursa may be protected with a piece of corn-plaster.

Congenital hallux varus and metatarsus varus. The great toe should be held against the two neighbouring toes by means of a band of adhesive plaster, and wide boots should be worn with the foot turned slightly inward.

Lateral deviations of the other toes or clino-dactylous conditions. The toes should be fixed in correct position by adhesive plaster, or a boot provided with a dorsal pouch for the crooked toe may be worn.

Hammer toes. Square toed boots are necessary, large enough on

the dorsal side not to rub against the folded and protruding great toe. The latter may be straightened and fixed to the two neighbouring toes by adhesive plaster, pieces of gauze being placed between them. The hard corns attendant on this deformity should be treated by ablation and protection by cornplaster.

Metatarsalgia, Morton's disease, or break-down of the instep. This may be due to inflammation and of short duration only, in which case rest and the wearing of a square-toed boot with a thick sole are all that is necessary. When there is a breakdown of the transversal plantar arch a strip of Velpeau, bandaged from the toes to the ankle, is effective.

Supernumerary digits. If these cause no real inconvenience it is sufficient to wear a boot with a pouch for the supernumerary digit in cases where it protrudes.

Webbed toes never cause trouble in walking and need no attention from the orthopedist.

Localised apophysitis or ostitis of the small bones of the foot. These are fairly frequent inflammatory lesions in young soldiers, but of short duration. Treatment necessitates a month's rest, mild revulsives and, when walking becomes possible, a boot with a special place for the painful bone.

Subungual exostosis. This may be tolerated with the protection of a hollowed corn-plaster and an appropriate boot preventing pressure on the exostosis. In such a case, however, it is better to operate, as a radical cure can be effected in 3 weeks.

Onyxis or ingrowing toenail. May be treated by the application of strands of thread, dipped in tincture of iodine, which raise the free edges of the nail.

Corns should be protected by fenestrated corn-plaster or treated by oblique ablation. Little wartlike appearances, which do not protrude but which may be very painful, should be destroyed by touching them at the centre with a drop of nitric acid every alternate day till cure.

Excessive perspiration of the feet. Preventive treatment consists in bathing the feet with a very weak dilution of formol and frequent change of socks. Socks with a ventilation hole in the anterior part of the heel may also be employed.

Blisters. To prevent these the boots must be flexible and kept well oiled; the feet also should be oiled before each long march.

The subject of the second meeting of the session, May 18, at 10 : 00 A. M., was Aviation.

AVIATION

Medical Aspects of Flying. Lieut.-Colonel JAMES L. BIRLEY, R. A. M. C., read a paper in which he stated that to be a successful pilot or observer a man must above all things possess "guts"; he must further have the flying temperament, and he must also be healthy. A man's past and family histories, his general demeanor and bearing are the best guides in assessing the stability of his nervous system and its capacity to withstand the various traumata to which it is going to be subjected. Pilots should come to their work fresh and keen, and it is wise to reject those men whose reserves of nervous energy have been partially exhausted by a long spell of service on the ground.

As regards vision, the British standards are comparatively low, as a man may wear glasses in the air and be a good pilot. Candidates must, however, have both color and stereoscopic vision.

The vestibular apparatus must be free from disease, and tests to confirm this should be made. In using the rotation tests the degree and duration of the forced movements induced, and also the degree and duration of the subjective sensations, are taken as guides rather than the nystagmus, which the British examiners consider too uncertain and too variable. The less the forced movement and subjective sensation the more likely is it, in their opinion, that the individual will not be unduly affected by the movements of the machine. If turning in the chair makes him feel sick and faint it is reasonable to suppose that spinning in the air will do the same. As regards night flying or flying in clouds a good deal of misapprehension seems to exist, and it has been stated that when deprived of sight the only impressions by which a man can be informed of his position relative to the earth are those arising from the labyrinth; whereas night flying pilots are unanimous in stating that they fly essentially by sight, using for this purpose an horizon of some sort or another. If they run into a thick fog, or are blinded by a flare or search-light, they do not know precisely where they are; and in the same way pilots have come out of a cloud in daylight upside down. Investigations show that the most common condition interfering with the functions of the labyrinth is obstruction of the Eustachian tubes, and the patency of both tubes should be insisted on in every candidate. The presence or absence of sea-sickness cannot be taken as necessarily indicative of a disordered labyrinth.

The general conclusions so far reached concerning the *period of inexperience* are briefly :

1. The labyrinth must be organically sound.

2. A normal labyrinth, deprived of the assistance of visual and muscle sense impressions, is not in itself sufficient to keep a pilot correctly informed of his position in space.

3. A labyrinth which over-reacts — or perhaps, more correctly a nervous system in which labyrinthine impressions are prone to radiate widely — is productive of ineffectiveness in the air.

In the second period, or *Period of Maximal Effectiveness*, attention is directed to the following points:

1. The abuse of alcohol must be strictly avoided.

2. Colds in the head and catarrhal conditions of the upper respiratory passages are apt to lead to Eustachian obstruction. They may also produce obstruction of the outlets from the frontal and sphenoidal sinuses, and if this occurs severe pain may be experienced at big altitudes owing to the fact that the imprisoned air is under greater pressure than the external air.

3. Due attention must be paid even to slight fevers, since they are prone to produce a temporary loss of tone in the cardiovascular and muscular systems.

4. All flying personnel should be warned of the importance of frequently opening the Eustachian tubes when flying and instructed as to how this can best be done. All cases of earache should be reported at once. Unilateral earache in pilots is nearly always the result of vascular congestion or even hemorrhage, secondary to Eustachian obstruction.

5. The clothing of aviators is of very great importance.

6. Crashes. The safety belt should encircle the chest rather than the abdomen, thereby minimizing the risk of the head falling forward and sustaining injury. The leather cushions on which the pilot sits must be fixed firmly to the seat. Due regard must be paid to crashes, however slight they appear to be.

7. The use of oxygen at high altitudes prolongs the period of maximal effectiveness and renders a man fully capable to discharge his duties in the air. The symptoms of oxygen want as they affect a man in the air are dyspnea, muscular weakness, impairment of judgment and *moral*, fainting or loss of consciousness, headache, over-filling of the bladder, vomiting. The symptoms noticeable after landing are:

a) Fatigue. One has only to watch a flight landing after a two or three hours patrol without oxygen at 18,000 feet to realise the enormous strain which modern flying under active service conditions imposes. The difference when oxygen has been used is quite remarkable and highly encouraging.

b) Frontal headache. This may be very severe indeed and persist for a whole day.

c) Cardio-vascular system. The pulse is rapid and the diastolic pressure low, the result being that the pulse pressure is increased. In bad cases, however, the systolic pressure is also depressed and readings as low as 90 mm. Hg may be obtained.

d) Respiratory system. Shortness of breath, inability to hold the breath, and even Cheyne-Stokes breathing, may persist for some time after landing.

Diagnosis of oxygen want. Dreyer's method is used, which consists in diluting the oxygen in the air breathed by the addition of nitrogen. It has been demonstrated that the normal individual reacts to the stimulus of lack of oxygen by all or some of the following changes: rise in pulse rate, rise of pulse pressure due to fall of diastolic pressure, deepening of the respiration, and concentration of the blood at expense of the plasma.

The third period, or *Period of Fatigue or Distress*, cannot be entirely anticipated. Its onset is subtle and depends on such variable factors as the individual, the type of work, the weather, enemy activity, etc. The results of exhaustion are summed up in three words: loss of effectiveness. The mental condition of a pilot in whom exhaustion is fully developed is highly characteristic. He becomes unsociable and irritable, is restless, can settle down to nothing, not even to write a letter or read a book, noise upsets him, he may hate hearing " shop " talked, and in many cases he cannot bear to see a machine landing on the aerodrome. His dash and confidence as a service pilot have disappeared, and his capabilities for flying have probably deteriorated, as evidenced by a series of bad landings and minor mishaps. A man who has reached this advanced stage will recover to a certain extent if rested, but for purposes of service flying he will probably never be the same man again.

The length of the period of stress should be limited in such a way that the rested man returns to the period of maximal effectiveness; and the flying personnel should be worked in short shifts, taking into consideration the nature of the work. The Commanding Officer and Medical Officer can do a great deal by working in close collaboration. The latter must not only be observant and approachable but must also possess a personality of his own and the gift of getting into close touch with his fellow men. Success in this part of his work can only be acquired by living amongst aviators and sharing their thoughts.

The paper read by Major Flach has not been received. The

paper on Gas Intoxication for obvious reasons cannot be published.

ABSTRACTS

ORTHOPEDICS

An Address on the Orthopedic Outlook in Military Surgery. By Colonel Sir Robert Jones, C. B. Ch. M., Inspector of Military Orthopedics, Army Medical Service. Abs. from *Brit. Med. Jour.*, Jan. 12, 1918.

The conditions which, taken together, create an orthopedic case may be classed roughly under the following heads :

1. The mechanical injury to bone, joint, muscle or nerve.

2. The atrophy and disease of these structures primarily due to the injury.

3. Incoordination of movement due to disease of the brain — a result of atrophy and disease of peripheral structures.

4. Psychological conditions which can be overcome by re-educational processes.

There are now sixteen centers in the British Isles containing close upon 15,000 wounded. Of the men treated in them 75 o/o have been returned to the army. An orthopedic center consists of :

1. A staff of surgeons who have had previous experience of the detail of orthopedic work, both operative, manipulative, and educational. They plan the complete course of treatment.

2. Men with experience in operative surgery who, though not specializing in the work, are interested in it, and only need experience to fit them to take charge of wards in new centers as they are formed.

3. Still younger men who will ultimately go abroad, to whom the educational advantages offered by the centers is of the greatest benefit.

4. A series of auxiliary departments, each under a medical man who has experience of the particular methods of the treatment he directs. These departments are the electric, the massage, the hydrological, the gymnastic and the curative workshops.

The successful working of an orthopedic center depends upon the coherent association of all departments in carrying out the plan of campaign mapped out by the surgeon when he sees the case.

Workshops have proved of considerable value, particularly from a disciplinary point of view. The work done in them — splint making, boot repairing, electrical fitting adjustment, clerical work, etc. — is productive and useful, must be performed by someone, and the wounded man feels that if it is worth doing at all it is worth doing well. In prescribing the work, however, care must be taken not to fatigue the disabled limb; indirect use gives better results, and the member should be exercised daily in one of the special departments.

The orthopedic problem can be divided into two distinct parts — preventive orthopedics and corrective orthopedics. The question of fractures of the femur is essentially one of *preventive orthopedics*. All fractured femurs should be concentrated in special fracture hospitals at the base. Each hospital should be staffed by well-trained surgeons with mechanical aptitude, desirous of devoting themselves to this special work for the term of their service. They should have selected nurses and orderlies to help them in team work, and they should be protected from the danger of frequent changes. Two fundamental principles must be sacredly adhered to :

1. Efficient fixation in correct alignment at the earliest possible moment.

2. Continuity of treatment.

For the purpose of rapid, simple and efficient fixation there is no splint to compare with a Thomas, which can be applied over the trousers and extension made by a pull on the boot. Cases should be sent down from the casualty clearing stations at the earliest possible moment after recovery from shock, before sepsis has had time to spread and before the danger of secondary hemorrhage has set in; they do best at the base hospitals when they are received there during the first three days. They should then go on to orthopedic hospitals, where it must be remembered that gunshot fractures of bones take a considerably longer time to harden than those encountered in civilian practice.

Both at home and abroad the defects of treatment run on similar lines — namely, inefficient reduction, fixation, and extension. What has been said about fracture of the femur is true of fractures of other bones. In the lower limb, fractures are too often associated with a backward sagging at the site of fracture, due to inefficient support; or they present a valgus deformity which renders the leg both weak and ugly. In fractures of the humerus, non-

union, or delayed union, is far too common, particularly when the fracture is through the middle third; this is mainly due to two factors — over-extension and inefficient fixation. The prevailing deformity in fractures of the lower end of the humerus is a backward thrust of the elbow. This is best governed by flexing the elbow sufficiently. Fractures through the elbow-joint, in view of ankylosis, should be treated at right angles. In this form of fracture, care should be taken to keep the forearm about three-fourths supinated, for a pronated hand with ankylosed elbow is tragic. To prevent vicious union between the two bones, and sagging or convexity to the ulnar side, the ulna must be placed in line before supination is secured. It is a sound rule in all fractures of the upper limb to see that *the palm is towards the face when the elbow is flexed.*

The functional results of primary excision of joints, as they are now filtering into the orthopedic centres, are very bad. On the other hand the results of immediate excision of the *wound* (not the joint) in cases of gunshot injuries to articulations, are often surprisingly good. A few suggestions may be offered from the orthopedic standpoint as to the after-treatment of these excisions :

If the shoulder is excised, the arm should be placed in an abducted position at an angle of about 50 degrees. The elbow should be slightly in front of the coronal plane of the body, so that when it is at right angles and the forearm supinated, the palm of the hand is towards the face. The bones should be approximated by posture at an early date. If ankylosis occurs in this position, the arm can be lifted to a considerable height by scapular action. The arm should not be left hanging, as there is on one side danger of a useless flail shoulder, while on the other, should it become ankylosed, the movement will be very limited. If the excision should result in a flail shoulder, it should be ankylosed in the position just described.

The same principles govern post-operative treatment of the elbow. After being extended and supinated during the early stages of drainage, it should be gradually flexed to a right angle, even if sinuses discharge; as, if it is kept straight while a suppurating wound heals, there is a danger of ankylosis in extension. If there is no suppuration it can be flexed from the first.

When ankylosis is feared, a joint should be placed in the position most useful for the patient in after-life : the shoulder abducted as described, the elbow at an angle of about 70° from full extension, the forearm nearly two-thirds supinated, the wrist in dorsiflexion, the hip in slight abduction and external rotation with full

extension, the knee in full extension, the ankle at right angles and very slightly varoid.

The importance of position becomes evident again in injuries of muscles and nerves. Voluntary action of the muscle — not necessarily movement of the limb — must be encouraged at the earliest stage. The surgeon must, however, watch that contracture or over-stretching does not take place. In recovering nerve injuries, the muscles supplied by the nerve must be kept continuously relaxed by splinting the limb. All deformities which would impede the action of the muscles should be corrected as a preliminary to nerve suture unless this subsequent correction can be easily secured without straining the fresh union in the nerve.

In corrective orthopedic surgery, the treatment of stiff joints presents a whole series of problems. A surgeon without considerable experience of manipulative methods, when tempted to move a stiff joint after gunshot injuries, had better pause, reflect, and refrain. This should be emphasized because in so many cases joints have been forcibly moved with disastrous results. If a stiff joint has to be moved under an anesthetic the bones above and below the joint must be protected, especially where a fracture has existed.

The orthopedic mind strives for function rather than for form, but is more content if it can secure excellence in both; it is conservative and constructive, but it desires to take the most direct road to function — be it by knife, by hand, or by suasion.

The Treatment of Functional Contracture by Fatigue. By E. F. Reeve, M. B., B. S. Lond., M. R. C. S., L. R. C. P. Lond., Captain (Temporary) R. A. M. C.

The principle of the treatment consists in producing a condition of fatigue in the muscles responsible for the contracture. This is obtained by continuous passive movements in a direction opposed to the normal action of the contracted muscles.

Description in detail of eight cases shows that most of the patients had been suffering from contractures for a great length of time. The following is an example : —

W. H., aged 37, was knocked over by a bursting shell in September, 1916. For some months he was unable to walk or even to stand; there were general tremors, and his left foot was fixed in a position of marked flexion. On admission on December 20th 1916 he could not walk without assistance, the sole of the left foot was drawn up by spasmodic contraction of the flexor muscles of the

front of the leg, and his weight when treading on the left foot was borne entirely on the heel. He was treated by repeatedly extending the foot against the resistance of the contracted muscles. After some hours the spasm of the flexor muscles disappeared and the foot could be moved without resistance as desired. Patient quickly walked quite naturally and was discharged on May 11th, 1917.

Advantages of the treatment are : —

1. The patient can not only generally cooperate in his own cure but later on can in turn help in the treatment of others.

2. No apparatus of any kind is required and no specialized knowledge on the part of the physician.

3. It is accessible to all.

3. It is applicable to cases which have been treated previously without success by other methods.

4. The process by which the contracture is actually eliminated is a physiological one and is not subject to interference from psychical factors, while fear of relapse is reduced by the patient's knowledge of the mechanism of both disability and cure.

Suture of Nerves, and Alternative Methods of Treatment by Transplantation of Tendon. By Lieut.-Colonel Robert Jones, Inspector of Military Orthopedics, Army Medical Service, *Brit. Med. Jour.*, May 6 and 13, 1916.

With regard to late suture of the nerve, certain general principles must be borne in mind :

1. The correction of contractures of skin or muscle and all the anatomical constituents, from skin to bone, on the side of the abnormal direction the contracture takes.

2. When possible, the freeing of joints from all adhesions and the restoration of the mobility of the joint in all cases where ankylosis is threatened.

3. The maintenance of the paralysed muscles in a position of relaxation throughout the period of recovery.

4. The practice of massage during recovery, but without once allowing the relaxed muscles to be stretched.

Before any operations are performed affecting the mobility of a joint, every use should be made of available muscle power. Neglect of this precaution may produce the unexpected recovery of muscles which were ignored because assumed to be paralysed. It is only possible to make quite certain by relaxing the muscle and

thus putting it into the position most favorable to recovery for a sufficient length of time (6 months).

The first stage of treatment is the correction of existing deformity. When this has been done the limb should be kept immovable until the ligaments, muscles, and even bone have become of normal length and shape. The continuity of treatment must be maintained or a relapse will result. This point is fundamental.

Tendon transplantation has frequently been performed with success in cases in which isolated nerves have been destroyed. Its object is to improve or restore muscular balance; it is not justified unless it improves function. The following transplantation operations may be recommended in various injuries.

For irreparable injury of the musculo-spiral nerve, *a*) the flexor carpi radialis and the flexor carpi ulnaris can be transplanted into the paralysed extensor of thumb and fingers; and *b*) the pronator radii teres may, in addition, be affixed to the two radial extensors.

For great damage to the median and ulnar nerves, operations on tendons alternative to those on the nerves will be very rarely required as compared with those on the external popliteal and the musculo-spiral, for the reason that by means of flexion of the elbow a gap of two or three inches in the median may be closed up; by flexing the elbow and displacing the ulnar to the front a similar space in this nerve can be obliterated. End-to-end suture, therefore, is much more easily secured in these two nerves than in the case of the musculo-spiral and external popliteal. The transplantation operation consists in *a*) inserting the outer tendons of the flexor sublimis into the inner tendons of the flexor profundus digitorum, and *b*) inserting the inner tendons of the flexor sublimis into the tendon of the flexor carpi ulnaris. The extensor carpi radialis is attached to the flexor longus pollicis.

The operation of transplantation in complete paralysis of the ulnar consists in attaching the two inner tendons of the flexor profundus to the two outer, and inserting the palmaris longus into the tendon of the flexor carpi ulnaris.

After operations for musculo-spiral paralysis the hand should be kept dorsiflexed until recovery of the muscle is complete. Even after the patient has learned to use his hand a dorsiflexion splint should be worn at night.

For paralysis of the crural nerve the sartorius and biceps may be transplanted into the patella.

In paralysis of muscles supplied by the external popliteal nerve there is not much scope for effective tendon transplantation; for an injury paralysing the two peronei muscles but leaving the

anterior tibial nerve intact, transplantation of the insertion of the tibialis anticus into the dorsum of the cuboid or into the base of the fifth metatarsal replaces the loss of the evertors and restores the balance of the foot. In cases of more extensive paralysis there is not sufficient muscle power remaining for it to be effectually distributed, and tendon fixation is then the best operative procedure, for it establishes a firm barrier against drop-foot and yet allows useful mobility.

In injuries to the sciatic trunk, when the whole nerve has been divided high up in the thigh and there is total loss of power below the knee, the patient can walk quite well in a jointed caliper splint with a filling inside the boot to keep the foot at right angles. Another useful plan is to fit a jointed knee cage with a spring and a right-angled support for the ankle, thus making the paralysed distal part of the leg into a species of artificial limb. The idea of rushing to amputation of a limb merely because the sciatic nerve is destroyed is too horrible to be contemplated, and actual experience has proved that the nutritive disturbances which should theoretically take place in the foot either do not occur or, at worst, are not so serious as expected.

AVIATION

The Effects of High Altitudes upon the Efficiency of Aviators. By Major E. G. SEIBERT, M. R. C. Abs. from *The Military Surgeon*, February 1918.

It is a well established fact that pilots show marked evidences of nerve breakdown or instability in greater or less time according to the individual. As the war has progressed, the altitudes to which pilots are forced to go have become more and more pronounced. The percentage of oxygen in the atmosphere remains constant, irrespective of the height. The partial pressure, or tension, however, varies and diminishes in a somewhat progressively proportional manner with the decrease in barometric pressure. It is the oxygen tension in the air cells of the lungs which is most important in maintaining the respiratory process. As the transfer of oxygen from the alveolar air to the blood depends, in part, upon the oxygen tension, it can readily be seen why oxygen want should promptly ensue on reaching high altitudes.

One other factor in this transfer of the oxygen to the blood is the activity of the alveolar epithelium, or cells lining the alveoli. This explains why some may go to these heights with less symptoms resulting than others.

In altitudes above 16,000 feet, where the barometric pressure is half the sea-level pressure and the oxygen tension reduced to one-fourth or less, the blood is quickly deprived of the necessary oxygen to carry on the body process, and allows of the accumulation of those substances which, sooner or later, bring on pronounced intoxication. This intoxication is particularly marked in the nervous system. Its effects are peculiar and especially dangerous to the aviator. Extraordinary impairment of judgment is extremely characteristic, though the person himself is quite confident that his mind is absolutely clear. Perception is more affected than sensation. Other effects are panting, difficulty in concentrating attention, headache and fatigue after landing, vertigo, vomiting, noises and pains in the ears.

Prime physical fitness is not always a guarantee that the subject will be free from nerve instability. This fact points very clearly to the necessity for selection of the men who have been in training for overseas work.

Some Observations on the Barany Tests as Applied to Aviators. By H. L. Babcock. Abs. from the *Boston Med. and Surg. Jour.*, Dec. 13, 1917.

These tests determine the presence or absence of an intact and normally active static apparatus. The principle underlying them all is this: Movement of the endolymph in the semicircular canals in a given direction stimulates the sensitive hair cells in these canals, and produce definite phenomena. These are: 1) a twitching of the eyes, or nystagmus, of a certain type; 2) vertigo; 3) so-called "past-pointing"; 4) falling reactions.

The tests used for the aviation candidates are based on the turning reactions only, — the caloric and galvanic reactions being omitted entirely, — as the only object is to determine the integrity of the labyrinth and its tracts, and not differential diagnosis.

1. *Nystagmus.* The patient is seated in the Barany chair with head upright, but tilted 30 degrees forward and pressed back firmly against the head rest. With his eyes closed, he is turned to the right ten times in 20 seconds. The chair is then suddenly stopped and the candidate told to open his eyes and look straight ahead at some distant point. There should occur a horizontal nys-

tagmus to the left of 26 seconds' duration. In a similar manner the candidate is turned to the left, although this is practically unnecessary, provided the first turning as given a normal reaction.

2. *Pointing tests.* The candidate, sitting in the chair, facing the examiner, closes his eyes and touches the examiner's finger, which is held in front of him. He next raises his arm to a perpendicular position, then lowers the arm, and attempts to find the examiner's finger — first with the right arm, then with the left. The normal individual is always able to find the finger. After turning the candidate to the right ten times in ten seconds, this test is repeated. During the last turn the stop pedal is released in order to lock the chair as it comes into position. This prevents any movement of the chair during the tests, which might offset the past-pointing. By past-pointing is meant the deviation of the candidate's finger to the right or left as he tries to locate that of the examiner. The right arm is tested, then the left, then the right, etc., until he ceases to past-point. In this instance the normal individual will past-point at least three times to the right with each arm. The eyes are kept closed throughout the test. The phenomenon of past-pointing is the result in this case of experimentally produced vertigo.

If the pointing tests are questionable, the vertigo is measured quantitatively in the following manner: The candidate is turned, with eyes closed, to the right at a uniform speed, and is asked to keep on telling the examiner in what direction he is being turned. Thus he says, "to the right, to the left," etc. After ten turns in ten seconds the chair is stopped and immediately he will say, "I am going to the left." The stop watch is started the same instant and kept running as long as the patient thinks he is going to the left. When he says, "I am standing still," the stop watch is stopped and the reading of the duration of the vertigo taken in seconds; in a normal case it is approximately 24 seconds. The test is repeated in a similar way by turning the patient to the left.

3. *Falling.* The candidate's head is inclined ninety degrees forward and held in place by a head rest. The eyes are closed. He is then turned to the right five times in ten seconds. On stopping the candidate raises his head and should fall to the right. As long as the head is kept in that position the vertigo remains horizontal, but on raising the head to an upright position, the vertigo at once becomes vertical, and the candidate, having the sensation of falling to the left, throws himself to the right in order to correct his supposed abnormal position. The test is then repeated turning to the left.

It is a well-known fact that stimulation of sensory nerve endings may affect the pulse-rate. Taking the general averages of 100 cases, pulse-rate findings immediately before and after turning show that the stimulation to the vestibular portion of the eighth cranial nerve end-organ by fifty revolutions, at varying rates of speed, produces an increase in the rate of heart action of nine beats per minute.

In a very few cases, an active reflex with the tenth cranial nerve has caused vomiting, especially after stimulation of the vertical canals. In no case has the candidate fainted.

The Ear and Aviation. By Isaac H. Jones, Major M. R. C. Abs. from *Jour. A. M. A.*, Nov. 10, 1917.

In order to preserve the wonderful accuracy necessary in controlling such a delicate mechanism as the flying machine, the aviator relies preeminently on his *ear* balance-sense. It is highly probable that many an aviator has gone to his death because, all unknown to him, he did not possess a normal ear mechanism. Even when an individual is standing or walking on the earth, his ears constitute his sense organs of balance; and he has in addition the contributory help of information received from his muscle sense and his sight. When he rises above the earth and flies in the dark it is obvious that these contributory factors are practically eliminated and that he must rely almost exclusively on the ear-balance sense.

The following briefly summarizes the fundamental principles underlying the examination for aviators. The aviator must have 20/20 vision without glasses. He must have 40/40 hearing. He must be a normal man, with the additional requirements of a certain relative height, weight, and chest measurement, and a definite vision and auditory acuity. Moreover, he must have a good *balance-mechanism.*

The tests for nystagmus, pointing and falling[1] are merely to determine whether or not the ear mechanism is normal. A limited number of candidates give what might be termed " border line " responses. It is here that the caloric test is useful. Water at 68° F. is allowed to run into the external auditory canal from a height of about 3 feet through a stop nozzle, with the head tilted 30 degrees forward, until the eyes are seen to jerk or the individual becomes dizzy. The length of time shown by the stop-watch in the normal

1. Some Observations on the Barany Tests as Applied to Aviators, p. 503.

is 40 seconds. The type of nystagmus is then noted; it should be rotary and the direction of the jerk should be to the side opposite the ear douched. The eyes are then closed and the past-pointing taken. The head is then immediately inclined backward 60 degrees from the perpendicular (or 90 degrees from the original position), when there should appear a *horizontal* nystagmus to the side opposite the ear douched. The eyes are now closed, and the past-pointing taken with the head in this position; after which the left ear is douched and the same procedure carried out. If the caloric test applied in one of these "border line" cases shows only a slight impairment of the responses from each ear, the candidate is qualified. A slight impairment would be indicated if, nstead of the normal forty seconds of douching, there was required not more than ninety seconds. If one ear shows normal responses, whereas the other shows responses only after *more* than ninety seconds of douching, the candidate is disqualified.

Many candidates feel that "jumping eyes" and evidences of vertigo are signs of weakness and would be counted against them. Supposing that the candidate, after having been urged "perfectly naturally," still fails to past-point, although he has shown a normal nystagmus and falling, the quantitative estimation of vertigo is taken. Should the candidate show over sixteen seconds of vertigo in both directions, the examiner then realizes that the absence of past-pointing was probably due to a calculated correction. The question is definitely settled by douching the ears. Although a candidate can estimate the significance of the sensation of vertigo after turning, he has no control over this sensation after douching; he is unable to calculate the meaning of the vertigo produced by the caloric test. Therefore, if he fails to past-point after the douching tests, he is definitely disqualified.

Visual Factors in Equilibration, Especially Aviation. By Percy FRIDENBERG. Abs. from *Journal A. M. A.*, April 6, 1918.

The author believes that other factors than a normal labyrinth, which has generally been assumed to be the essential in equilibration, should be taken into consideration, and especially visual factors, which merit more attention in determining physical fitness than has so far been paid them. Clean vision and normal ocular muscle balance are especially necessary.

Forms of dizziness that may render a man unfit to control an aeroplane may result from neurasthenia, anemia, chronic alcohol-

ism, malaria, chronic nicotine poisoning, and many other toxic states, as well as in chronic intestinal indigestion, lead intoxication, and convalescence from various diseases. Apparently healthy subjects complain also of dizziness due to various ocular anomalies, among which may be cited mixed astigmatism, accommodation spasm and paresis, ocular and motor imbalance, retinal hyperesthesis, and asthenopic strain from whatever cause, functional, organic, or, finally, exterior, such as defective or improper illumination, position, or work, faulty or ill-fitting glasses, especially prisms or cylinders, all of which defects are quite sufficient to cause dizziness to an incapacitating degree.

Labyrinthine disease is not common, and patients suffering from it are critically ill. The same may be said of dead labyrinths. No person suffering from such disorders is likely to be a candidate for flying.

Extreme or irregular stimulation of the organ of vision, dazzling or blinding, may cause dizziness to the point of complete lack of balance and loss of consciousness.

Irregular illumination and motion of objects alone are sufficient to cause dizziness and confusion. A swinging mirror may cause vertigo and it cannot be too often repeated with emphasis that vertigo is a disturbance or partial loss of consciousness.

As a practical test, the condition of having a dead labyrinth, the author believes, may be rather an advantage than a disadvantage so far as flying is concerned, because normal labyrinths merely afford the possibility of vertigo and dizziness. Some authorities, such as Von Cyon, even contend that the inner ear can give no information as to the body's relation to the vertical or to space.

The author further calls attention to the fact that in our instinctive concepts of balance, the lateral balance, from side to side, is the usual one, and that it rarely fails. The forward and backward equilibrium is much less secure, and when we fall it is usually in one of these two directions. Thus confusion or dizziness is usually attributed to false horizontal motion. The sense of the vertical, it would seem, is called on to a greater degree in aviation. Possibly also the vertical semicircular canal plays a more important rôle. It would be instructive to learn, the author thinks, whether there is such a thing as rotational vertigo in a vertical, as well as horizontal, plane.

Normal distinct vision, as determined by the test card with the formuls 20/20, is a natural requirement. Other qualifications are also important : hypersensitiveness to bright light; sharpness of the sense of motion; the acuity of vision in lowered illumination; the

appreciation of contrast in form, color, and light; the rapid and accurate judgment of distance, direction, size, and — depending upon all these — space.

The Examination of Aviators. By F. A. Bachman. Abs. from the *U. S. Naval Medical Bulletin*, Jan. 1918.

The writer considers it important to test the emotional apparatus of the flier as well as his physical fitness.

A new departure in physical examinations is the introduction of the Barany test of the vestibular function[1].

The procedure of examination is somewhat as follows.

General examination : Height, weight, chest, lungs, bones, joints, skin, nervous system, vertigo, vascular system, digestive system, urinalysis, Wassermanns.

Dynamic tests : Walking in a straight line forward and backward for twenty feet, maintaining a position for one minute without swaying.

Vision tests : Stereoscopic vision should be perfect. Ocular movements may be tested by having the eyes follow the movement of the tester's finger in all directions. The movements should be regular and identical. Pupillary reactions should be regular and equal in each eye when responding to direct or indirect light stimulation and to accommodation. Intraocular tension may be tested roughly by palpating the eye with the index finger of each hand through the upper lid, as the candidate looks downward. The tension of one eye should be compared with that of the other and with that of an eye believed to be normal. If the tension is not normal it is a cause for rejection. Ocular nystagmus if rythmical and if it occurs upon looking straight ahead or laterally (40° or less) is a cause for rejection. A restricted field of vision in either eye, if confirmed by a perimeter, constitutes cause for rejection. The Jennings test cards are used for color perception. The candidate punches through the perforation and so makes a permanent record card.

Muscular balance, at 20 feet. Hyperphoria, exophoria, esophoria. Muscular imbalance may be determined by a phorometer.

Visual acuity. 25/20 required for each eye (Snellen's type 20 feet). The near point should not be more than 11 cm., at 20 yrs., 13 cm. at 25 yrs., and 15 cm. at 30 yrs.

Ophthalmoscopic findings. One drop of a 5 per cent. solution

[1] See p. 565.

of euphthalmine in each eye held with the eye closed for fifteen minutes and then another drop in each eye held for fifteen minutes more, may cause a pathological condition of the fundus : if so, it is cause for rejection.

Ear tests : The history of ear troubles should be noted, such as, discharge, buzzing, ringing, noise, vertigo, seasickness, cranial injury. The appearance of the ex-auditory canal and of the membrani tympani should also be noted. The hearing for each ear should be normal, and can be tested by the whisper and watch methods, although the writer considers the watch method the more reliable. The tick of an Ingersoll watch ought to be heard at a distance of about 40 inches.

The Eustachian tubes should be examined per catheter, and also there should be an examination for diseased tonsils, adnoids, etc.

Equilibrium. The Barany chair method is used for this test[1]. Nystagmus, pointing, falling.

Psychological tests. These are carried out by means of a Hipp chronoscope or a d'Arsonval chronometer. The author expresses some doubt as to the value of this test for the psychological reactions. He thinks it would be more valuable if some sort of test were devised to determine the emotional characteristics of the candidate and also the accuracy of his judgment. These are qualifications which the instructor is quick to observe. At the Naval Hospital in Philadelphia, an attempt has recently been made to measure the attribute of judgment. Candidates have been asked to estimate the length of sticks of various size when compared with a yard stick. Their sense of time has been tested by having them estimate the time required for sand to pass through a time glass. Speed judgment was tested by displaying a series of three revolving 9-inch discs, rotated at various but slightly different rates of speed. The candidate was required to arrange the disks in the order of their speed. Judgment of arrangement was tested by a square of wood sawed into seven pieces. The time necessary for the candidate to arrange the pieces so as to make a perfect square was noted. The results obtained by testing one hundred men in this fashion, the author believes, warrants the institution of such tests in determining fitness in aviation.

1. See p. 503.

GAS INTOXICATION

The First Symptoms of Intoxication by Mustard Gas. By A. GIRAUD. Trans. and Abs. from the *Jour. de Méd. et de Chir. Prat.*, Nov. 25 1917.

The author remarks that although the symptoms resulting from mustard gas are all late, the various types of lesion appear at different times.

Lesions of the eye appear first. They are clearly defined within from 6 to 12 hours of the gas attack, and are completely established within from 24 to 48 hours.

Burns, if serious, may develop as early as the conjunctivitis, or even earlier. Burns of a less serious nature, however, may not appear until the 4th or 5th day. Sometimes they are not evident until the 10th or 15th day.

The respiratory lesions appear within from 2 to 4 days.

Eye lesions are the most frequently observed. They are of the congestive type. The vessels of the conjunctive tissue appear sinuous and dilated, and are of a bright red color. Sometimes the confluence of the vessels leads to the forming of little pools the size of a lentil. Although in serious cases the pain may be very great, it is usually not very marked, and in some instances it is wholly lacking. There is very little tear secretion and the sight is rarely impaired. The pupils react to light and distance. The lids may be swollen. Light eye lesions usually heal within from two to three days.

Lesions of the respiratory organs are usually localized to the larynx, the trachea, and the large bronchi. The larynx is especially affected. On the other hand, the intermediary and small bronchi are not affected. The usual bronchitis sounds are not audible. It appears that the gas loses its power as it advances into the respiratory canals.

Aphonia is the first symptom, appearing almost at once, but sometimes preceded by fits of coughing. The aphonia is complete and lasts for four or five days. The coughing is painful and sounds like the whooping cough. At the end of two or three days mucous and purulent matter is coughed up. It becomes difficult to breathe lying down. Hemoptysis has never been observed by the author.

Unlike the lesions of the eye, the respiratory disturbances are very tenacious. Frequently when they appear to be almost well, all the symptoms may break out again. There may be two or three such relapses.

Serious burns appear within 12 hours. A large inflamed area is covered with large blisters filled with serum and sometimes with purulent matter. Sometimes instead of blisters there are small vesiculae enclosing the roots of the hairs. The pain is always great. Late appearing burns are generally insignificant, and are much like sun-burn. They are rarely observed on exposed parts.

Prophylaxis and Treatment. For the conjunctivitis and burns the author finds a solution of bicarbonate of soda (30 per 1,000) helpful as a preventive measure if used immediately after the gas attack, and as a wash for the lesions to be followed by bandaging with Vincent powder (boric acid and hypochlorite of chalk).

The author finds the respiratory lesions resistant to all treatment. He thinks purely symptomatic remedies such as expectorants, counter-irritants, and opiates may help.

Treatment of Chlorine Gas Poisoning. By A. Stuart Hebblethwaite, Capt. R. A. M. C. (T. F.). Abs. from the *Jour. R. A. M. C.*, Dec. 1917, Vol. XXIX, N°. 6.

The author recommends the following treatment for slight cases:

1. Ammonia capsules.
2. Atropine 1/50 grain hypodermically.
3. Fluid or light diet for 24 hours.
4. Open air in a marquee during the day to ensure constant change of air.
5. An expectorant mixture of ammonia carbonate on the second day.
6. Evacuation to base on the 3rd day if condition admits.

After the administration of the ammonia and atropine from 15 to 25 ounces of blood are withdrawn. After 48 hours a light diet may be given, and an expectorant mixture of ammonia carbonate. If venesection is practised on admission, these cases do well. Oxygen administered through a mouthpiece is beneficial.

In cases of heart failure, venesection does no good. Stimulants, such as strychnin, digitalin, and pituitrin have given good results.

In connection with the other treatments, venesection is strikingly effective in relieving cyanosis, congestion in the lungs, and acute headache, besides inducing sleep. Early venesection is most effi

cacious. If it is performed late, cardiac stimulants are required.

Ammonia carbonate given on the third day to patients with copious frothy sputum is helpful in clearing up the chest.

Ipecacuanha administered in quantities too small to cause vomiting, cleared the chest up equally well.

Morphia is useful not only for promoting sleep but also in reducing the pleuritic pain at the costal margin caused by the emphysematous condition of the margin of the lung. It may be used when applications of iodine, mustard leaves, and fomentations have failed.

Postural treatment by raising the foot of the bed is helpful in cases so severe that the reflex of coughing is abolished. If a patient is conscious, he should lie on his side with the lower end of the bed raised a foot. An unconscious patient may be placed on his back, and the lower end of the bed raised two feet. Thus the pulmonary secretions are brought down.

Pulmonary emphysema giving rise to agonizing pains begins usually on the third day along the margin of the lung. Painting with strong iodine is effective. Morphia, if it can be administered with safety, affords relief.

Punctiform Hemorrhages of the Brain in Gas Poisoning. By Major F. W. Mott, R.A.M.C. (T.). Abs. from the *Jour. of Royal Army Medical Corps*, July, 1917, Vol. XXIX, N° 1.

Mott discusses the causes of punctiform hemorrhages of the brain that have been observed in cases of death from shell shock with burial, and in fatal cases of gas poisoning.

In 1907 the author noted the presence of such hemorrhages in cases of poisoning due to the inhalation of C O employed in the manufacture of nickel. In these cases the appearance was the same as in those of suicide by illuminating gas.

The author explains the presence of miliary hemorrhages in the white matter of the cerebrum and basal ganglia, and not elsewhere in the brain, on the following grounds:

1. Anoxemia causes the heart to beat faster, and thus to do more work with less oxygen, causing fatty degeneration.

2. Irritative and degenerative endothelial change in the cerebral capillaries, as shown by mitosis of the nuclei, and a fatty degeneration, made apparent by osmic acid staining. These changes may be due to C O in the serum, but they may be aggravated by

pneumococcal toxin, which tends to increase fibrin and hence to favor thrombosis.

3. The anatomical condition of the vessels in the white matter of the cerebrum, where the arteries are terminal; each small artery having a separate capillary system, likewise the emerging veins.

4. A tendency to stasis may be brought about in these separate vascular systems by the failure of the heart as a force pump and suction pump, also by those respiratory conditions which lead to right heart dilation, and interference with the return of blood from the skull.

5. In gas cases, hemoglobine has been turned into pigment granules, and hence the hemorrhages may be accounted for by the occlusion of the arteries.

A Note on Blood Changes in Gas Poisoning. By JAMES MILLER, Capt., R. A. M. C. (T.) and HARRY FAIRY, Capt., R. A. M. C. (T.). Abs. from the *Lancet*, Jan. 6, 1917.

The analysis of 14 cases leads the author to the following conclusions:

A gassing sufficient to produce symptoms lasting for some time gives rise to a more or less marked lymphocytosis.

This result is brought about only after a considerable lapse of time, probably 2 to 4 months at least. When the condition is once established it continues for about a year if symptoms of any kind persist.

There is apparently no marked change in the number of leucocytes per cubic millimeter. If anything, there is a slight reduction.

The author does not know whether the change is common to all types of gas poisoning or whether it is peculiar to one or more varieties.

A Blood Change in Gas Poisoning. By JAMES MILLER, Capt. R. A. M. C. (T.). Abs. from the *Lancet*, May 26, 1917.

The type of gas poisoning and the chemical nature of gas appears to make no difference in determining blood changes.

Although there is generally an increase in lymphocytes in cases with persistent symptoms, the author states that he has observed cases of moderately severe gassing in which the count remains either normal or within the limits of error.

In order that the test may be of value the author considers that

the lymphocytosis should be so marked that the lymphocyte count approaches closely that of the polymorphonuclear leucocytes. If this is the case, it may be assumed that the patient is still suffering from gassing.

The ordinary small lymphocyte of the blood is the cell that is increased. The increase is an absolute one and may be accentuated or the reverse in a differential estimate as the leucocyte count may for any reason be increased or diminished.

The author states that the cause of the lymphocytosis is not clear, but he thinks it may be in part due to a chronic inflammatory change in the respiratory and gastric mucous membranes.

Intoxication by Asphyxiating Gas and Its Treatment. By ARMAND COLARD and PAUL SPEHL. Trans. and Abs. from the *Archives Médicales Belges,* July, 1917.

The authors make the following classification according to the respiratory phenomena:

A. Very acute and pronounced asphyctic syndrome, with deep cyanosis, blood vomiting, and early death.

B. Acute asphyctic syndrome following only slight symptoms of intoxication.

C. Syndrome of caustic tracheo-bronchitis.

The cases considered in the article belong to groups B and C.

Group B. — As soon as the gas has been inhaled there is an acute irritation of the respiratory and upper digestive tracts, which may even cause nausea. The symptoms may subside for a short period, but a few hours later dyspnea increases gradually. When admitted to the hospital, these patients show all the symptoms of acute asphyxia.

In all the patients observed, except one, the respiration was shallow and rapid. The most serious case, however, had a slow and very painful respiration with inspiratory and expiratory dyspnea.

As a rule the pulse is even and regular, but rapid.

Blood tests indicate a slight deficiency of red corpuscles. The viscosity is increased and the blood of the median cephalic vein is black and thick.

Auscultation of râles in all of the cases proved that the irritating action of the gas affected the smallest bronchial ramifications.

Tracheo-bronchitis may last several weeks with a persistent retrosternal pain and great sensitiveness of the trachea on palpation.

In all the cases at the end of two or three days the sputum was

of a dark yellowish color. Later it became muco-purulent and sometimes it contained blood.

Group C. — The symptoms of the first few hours were like those of group B. Instead of the asphyxiating complications observed after the recrudescence in group B, patients of group C continue with tracheo-bronchitis. When the asphyxia has disappeared, the two groups again have similar symptoms. In group C the râles may be heard for about six days, although they sometimes disappear in two. The temperature generally falls on the second or third day, and then the pulse returns to normal. Even if every serious symptom has disappeared, gas cases must be watched carefully, especially during the second week.

Complications. Broncho-pneumonia is much to be feared. This may cause gangrene or tuberculosis. Bleeding and prolonged inhalation of oxygen seem to have been the most efficacious form of treatment. Weakness of the pulse is not, in cases of severe intoxication, a contra-indication of bleeding. From 300 to 500 cc. of blood should be removed as early as possible.

The oxygen should be administered under constant pressure and continuously. The patient should be kept in an atmosphere of pure oxygen until all alarming phenomena have disappeared, even if this requires a continuation of the oxygen supply for several days.

The apparatus used enables several patients to be supplied from the same tank at the same time.

Good results have also been obtained by the use of digitaline.

SURGERY

War Surgery of the Chest. By A. L. Lockwood, Captain, R. A. M. C., and J. A. Nixon, Captain, R. A. M. C. Abs. from the *Brit. Med. Jour.*, Jan. 26 and Feb. 2, 1918.

The authors recall that until about the middle of July, 1916, it was generally not thought necessary to excise parietal wounds unless they were badly infected. At that time it was realized that all wounds of the diaphragm left unrepaired proved fatal, and that simple repair was not always sufficient.

Chest cases that require surgical treatment — especially trauma-

topnea — require it as early and as promptly as abdominal cases. Suture at the advanced dressing station or even the regimental aid post is desirable.

Such cases are put in warm blankets at the casualty clearing station. Continuous rectal administration of soda bicarbonate is given if required. In severe cases blood transfusion is indicated. Hot drinks may be taken but no stimulants. Every effort should be made to induce sleep and, if necessary, omnopon or morphine may be administered. Dyspnea from hemothorax or pneumothorax should be relieved before operation by aspirating. Serious cases should be operated as soon as conditions permit.

Careful localization of the missile by X-ray and repeated X-ray examinations during the progress of the case are essential. If the missile is observed to have traversed the mediastinum and penetrated both sides of the chest, early operative treatment should never be undertaken.

A separate theater is reserved for chest surgery and a uniform temperature of 80° is maintained. One ampoule of omnopon-scopolamine is administered an hour before the operation. If not sleeping, the patient is given half of an ampoule half an hour before being taken to the theater.

For the operation the patient should be given the half sitting posture, if possible, and the injured side should be dependent. If this position is not possible, the lung should be grasped with forceps of the Collin pattern immediately upon opening the thorax so as to correct displacement of the mediastinum.

The skin is prepared with picric acid. Paravertebral anesthesia is administered for two or three spaces above and below the wound. A local infiltration around but at some distance from the wound is added. Novocain 0.5 o/o, potassium sulfate 0.25 o/o in normal saline is injected with Gray's syringe. Never should ether or chloroform be used in chest surgery. Resection of the fourth rib from the mid-clavicular to the posterior axillary line furnishes the easiest access to the thoracic cavity. Operation should be as rapid as possible. It is important to avoid strong retraction on the chest wall, whereby shock is increased and the mediastinum disturbed.

A missile should never be left in the liver. The track in the liver should be thoroughly cleansed. After this operation the diaphragm should be closed with mattress sutures of catgut on a blunt needle. The authors do not consider it necessary, however, to suture the diaphragm to the wall in case it is stripped from its parietal attachment. It is wiser to deal with wounds of the

abdomen after closing the chest. The utmost care should be exercised to cleanse the wound of all debris before closing. The chest should always be closed unless there is extensive gas infection of the lung tissue itself adherent to the wall. The chest must be hermetically closed with the first layer of muscle and close approximation of skin edges is essential. No fluid should be allowed to collect in the pleural cavity after the operation.

The use of 7 in. adhesive plaster to secure the dressing is helpful, in that it tends also to relieve the strain on the sutures and leaves the uninjured side free for expansion.

After the operation the patient should be given a semi-recumbent position inclined towards the injured side.

A " two step " operation is indicated when extensive trauma makes it necessary to treat thoroughly both orifices of a through and through wound, or when there is laceration of the diaphragm on both sides. Resection and drainage are rarely necessary and should not be resorted to unless severe constitutional symptoms of sepsis are present.

If there is undue restlessness after the operation, omnopon in small doses is freely administered. Every possible means of counteracting acidosis is employed.

Broncho-pneumonia is a complication greatly to be feared. If a case shows signs of this complication on the uninjured side early operation must not be lightly undertaken, but, if undertaken, only local anesthesia should be used.

Some Statistical Results of the Treatment of Chest Wounds. By T. R. Elliott, Lt.-Colonel, R. A. M. C. Abs. from the *Lancet*, Sept. 8, 1917.

Whatever the mortality of chest cases may be, deaths almost alway occur in the first month. If the patient survives this date, the injury is not likely to prove either fatal or disabling.

Lung wounds in the war are accompanied by laceration of greater or less degree, and yet the after-history of hemothorax cases in general does not indicate that lung laceration delays convalescence.

A simple traumatic pneumothorax is a very benign condition, and is not likely to be followed by sepsis or serious effusion. There are no crippling restrictions to respiratory movement, such as persist with a lung that has collapsed beneath clotting blood.

In cases of aspirated sterile hemothorax, the aspiration was generally performed on some day from the 6th to the 12th after

the wound, and oxygen replacement was used so as to enable the fluid to be removed as completely as possible at a single operation. A second operation was very rarely needed in France, and it never produced more than 10 oz. of fluid in any case.

Aspiration never caused any trouble or evidence of recurrent hemorrhage, and not a single one of the cases so treated developed infection later in England.

The author remarks, however, that a large hemothorax occasions a longer delay in returning to duty than small effusions. He is inclined to think that sepsis in the hemothorax may hasten recovery from the crippling effects of a large hemothorax because the digestive processes of infection tend to discharge with great rapidity the fibrinous masses of blood clot that otherwise might resist the expansion of the lung in its lower half.

He thinks it unnecessary to aspirate small effusions of about 30 oz., which extend only half way to the axilla and do not cause cardiac displacement. These are quickly absorbed by natural means. Aspiration of large effusions, however, has given good results.

In cases of septic hemothorax, the original volume of blood varied greatly. In some there was probably only an infected pleural effusion. When danger to life has been averted by a proper drainage, then all infections quickly assume a common place character. Much depends upon the proper placing of the original drainage and the satisfactory removal of carious ribs.

The author remarks, however, that the opinion has been gaining ground that active surgery undertaken as early as possible after the injury is the best means of dealing with chest wounds and of avoiding the difficulties that almost always result from retained missiles and shell fragments.

Such operative treatment should include:

Closure during the first 24 hours of all open wounds with air suction and free bleeding from within. (Drainage at an early date is to be avoided.)

The removal of all shell fragments except those of small size.

At a later date, the removal from the thorax of all other retained foreign bodies, when the danger of infection has passed away.

Mortality from chest wounds is due to hemorrhage, infection, or complicating wounds of the abdomen or spine. There is almost no late mortality in England and only about 5 o/o on the lines of communication in France. In the area of the armies, however, it amounts to 10 or 15 o/o in the medical units at an early date, and to about 10 o/o in the casualty clearing stations as a result of sepsis.

In cases developing sepsis within the chest, the mortality is very high, amounting to about 50 o/o under the present method of treatment, which is rib resection and drainage.

In cases with air suction and hemorrhage, treated only with occluding pads, mortality is exceedingly high.

Tangential wounds with severely comminuted ribs and mangling of the lung near the wound, are liable to severe streptoccic infection unless the wound tract is thoroughly cleansed.

In the majority of those with large retained fragments of shell, death follows soon after hemorrhage.

In cases with small retained projectiles, the presence of the projectile appears to bear no important relation to the septic hemothorax that occurs at the base hospitals.

The old surgical theory of non-intervention except by late drainage is justified only in those cases which do not develop sepsis (about 75 o/o). The high mortality in cases of sepsis, however, indicates the need of a wider practice of the new prophylactic method of early operative cleansing.

Tendon Suture. By Torr Wagner Harmer. Abs. from the *Boston Medical and Surgical Journal.* Dec. 6, 1917. Vol. CLXXVII, No. 23, p. 808.

The author recommends a technique for tendon suture which he finds is not generally familiar. He describes it as follows:

The stitch is of silk and consists in overcasting the lateral margins of both ends of the divided tendon. The overcasting starts about the width of the tendon, or a little more, back from the point of division, and comprises several whippings about the side of the tendon down to the line of division, each loop including somewhat less than one-quarter of the circumference of the tendon. When a tendon is ready to be brought together, each end then carries two stitches and each stitch two ends. The two parts of the tendon are now brought together and the two suture ends nearest the line of division on one side are tied. The two pairs of stitch-ends on the other side are then similarly tied... The long ends tied along the side of the tendon seem to serve as lateral splints. The objection that they occasion too much suture material in the wound is refuted by the fact that the author has never seen any harm from them.

A dry wound before closing is desirable...

Care is taken in closing the wound to approximate the fascia and skin separately. *No splint is used.* Active motion is started as soon as the patient has recovered from the anesthetic. This will

never be too energetically done on account of the pain which it causes.

The author gives in detail a case in which 24 tendons ends in the wrist of a five-year-old boy were approximated and sutured with almost perfect functional results.

The Transplantation of Bone. By W. E. Gallie and D. E. Robertson. Abs. from the *Jour. A. M. A.* April 20, 1918.

The writers declare that bone transplantation in clinical practice has been put on a sound scientific basis. They report results from four years of experimentation and clinical experience.

They conclude that although an autogenous bone-graft may result in the death of all the cells in the lacunae and most of those in the Haversian canals, nevertheless on the surface of the graft and in the open mouths of the Haversian canals, many osteoblasts persist and absorb nutriment from the bathing lymph, and therefore proliferate and produce those changes that make autogenous grafts valuable in surgery. Thus new bone is laid down and old bone replaced. These changes and the replacement are slow in hard dense bone such as the crest of the tibia, but very rapid in open cancellous bone, such as a rib.

Of great importance is the abundance of osteoblasts on the surface of the graft. If the endosteal and periosteal surfaces are undisturbed and exposed to a good supply of lymph, the changes occur with certainty and rapidity. If endosteal and periosteal surfaces are removed, very little ostogenesis takes place from the graft itself because of the scarcity of the osteoblasts.

To insure success in the autogenous grafts, it is necessary to supply living osteoblasts in the largest possible quantity. Living osteoblasts survive only on the surfaces. If the tibia is used for cutting the graft it should be taken, not from the crest, but from the face of the bone, and the width of the graft should be made greater than its thickness. The old theory, that grafts should be cut from the solid crest of the tibia, has been wholly refuted by the authors' experiments. It is much better to avoid the tibia, when strength is not the primary requisite, and to use a rib slotted so as to expose the endosteal surface to the supply of the lymph. The amount of bone regeneration from a rib is much greater than that from the long bones. It is wise to split the graft longitudinally into a number of pieces, since in this way more bone surface will be exposed and more osteoblasts will survive.

In operating for an ununited fracture in a long bone, the authors

insert a single graft strong enough to fix the fragments and then fill in around it with a number of smaller strips. They believe the periosteum is not essential to successful transplanting.

When the autogenous graft is not essential and when fixation is the chief object of the operation, the authors recommend the boiled bone graft as having decided advantages. At the end of two months the union of the dead to the living bone is solid. The changes that take place in the autogenous graft also take place in the boiled bone graft. New bone is laid down on the surface of the graft and the dead bone is gradually replaced by the living.

These observations were first made in experimentation but similar results were obtained later in clinical practice. In 60 cases of Pott's disease a spinal graft operation was performed. Also in cases of non-union or mal-union autogenous grafts were used. In 60 or more recent fractures boiled bone plates and screws, or screws alone, were used.

In the open operation for non-union, the writers favor the inlay graft as described by Albee, preferring it to the medullary plug, which obstructs the canal and prevents the outflow of osteoblasts. They drill holes and make sawcuts in the ends of the fragments to stimulate the inflammatory reaction which is necessary to osteogenesis.

The Technique of Amputations, Particularly the Treatment of Nerves. By EDRED M. CORNER. Abs. from the *Journal R. A. M. C.*, May, 1918.

The author emphasizes the importance of early closing of nerve ends as a means of avoiding subsequent nerve irritation resulting from amputation. He argues that a nerve end left open in a healing and especially a suppurating wound treated with chemical irrigation, even if the nerve is cut short, receives a certain amount of irritation which may lead to serious and lasting consequences. Sometimes such irritation may respond to surgical and medical treatment, but often it is beyond the reach of the surgeon.

He believes that the logical procedure is to close the open nerve, as by a ligature after proximal and several crushings of the nerve with artery forceps. As the divided end of the nerve will be sealed in a few hours, the ligature should be of the finest and most quickly absorbed catgut.

The end of the nerve, capped by sterile crushed nerve tissue, is then covered, sealed, and held in place by the ligatured nerve

sheath. It is best to block the large nerve trunks with novocain injections before crushing them.

Instead, if the nerve end is large enough for manipulation, nerve flaps may be cut so as to close the open end. The nerve is divided by two cuts, making two rather long flaps which are brought together, closing the nerve, as it retracts, by the pressure of the surrounding structures. Flaps made in the perineurium cannot be relied upon to close the nerve.

Bone closing has also been unsatisfactory. Periosteum and osteoplastic flaps have never succeeded. The author believes that the saw used in amputations has been responsible for the thrombosis of vessels by the heat generated by the friction, and hence the necrosis. He prefers the guillotine technique.

Divided muscle, left open, is subject to the same dangers as open nerves and bone. He believes that cut muscle should be sealed with a continuous catgut suture. Such a procedure greatly lessens the amount of fluid exuded and makes the identification of the divided structures easier.

In conclusion the author states that the skin of no amputation wound should be sutured until all open structures, except, perhaps, bone, have been sealed.

Preliminary Report on the Pathological Findings in the Nerves Following War Injuries. By Captain SYDNEY M. CONE, M. R. C. Abs. from the *Brit. Med. Jour.*, Nov. 10, 1917.

The author insists that without a good stain for axis cylinder and medullary sheath one cannot do nerve work in the laboratory. His technique is a follows :

Specimens are hardened in a 10 per cent formalin solution and then carried through the alcohols to ether and absolute alcohol and celloidin. Thin sections are preferable, but good results may be obtained with section 20 m thick.

The section is washed in water and placed in carbol-fuchsin fifteen minutes, momentarily in water, 1 per cent osmic acid 5 minutes, water 2 minutes, acid alcohol 1 per cent 10 seconds, 95 per cent. alcohol 5 minutes. Absolute alcohol and oil of cloves are now used alternately until the section appears deep pink but translucent; it is then placed in xylol for two minutes and mounted in Canada balsam.

The author notes particulary the irregularity of growth of new safciculi of nerves in the proximal end of the nerve about the old

parallel running fibers as far as the bulbous enlargement at the wound.

The operation aims to expose the nerve, — with due care regarding all anatomical relations, — and the incisions are made in a line parallel to the fibers. Excisions of the nerve are then made leaving greyish-pink, moderately soft nerve-ends. Suture is performed with chromicized catgut. Cargile membrane, fascia, or muscle covering are used to protect the area of suture from future adhesions.

The author adds a series of observations regarding nerve growth :

In some cases no fibers at all were to be seen at the bulbous enlargement but such was only rarely the case.

Wherever young fibrils were found, there was great cell proliferation.

The adhesion invariably contained cellular young nerves, some with a faint line of myelin covering the axis cylinders. Others were well protected by a medullary sheath and sheath of Schwann. A great number of neuroblasts were observed in the adhesions particularly at the distal end.

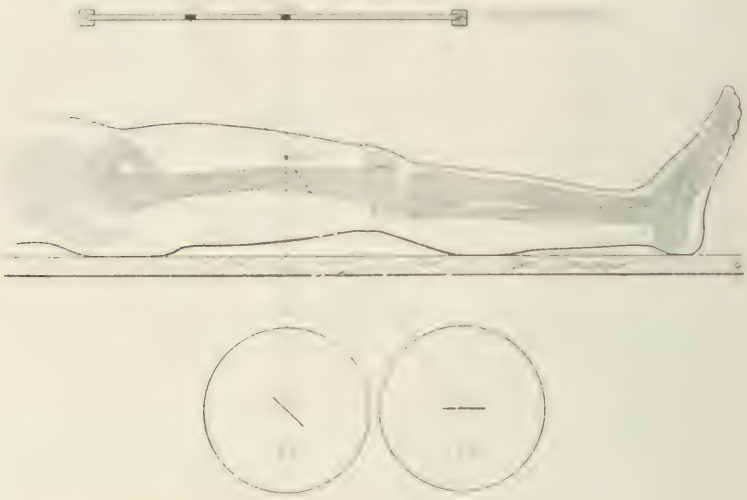
The author mentions especially the cones (barbs or "*renflements biconiques*" in the youngest fibrils of adults or embryo, and also the vacuoles ("*gonflements*" of myelin moniliform appearance of fibrils. due to the neurokeratin framework.

Method of Localization and Extraction of Projectiles by the Simultaneous Use of Two X-Ray Tubes. By Dr. de Rio Branco. Trans. and Abs. from the *Bull. et Mém. de la Soc. de Chir. de Paris,* March 26, 1918.

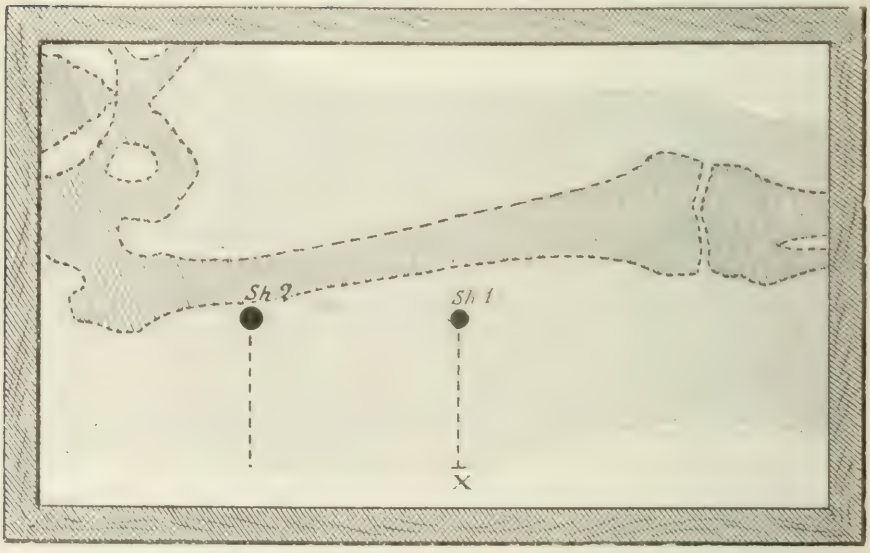
The author projects simultaneously on his screen the shadows of the projectile, obtained in one case by a tube producing vertical rays, and in the other by one producing oblique rays. By regulating the tubes, both rays can be made to project the shadow of the missile to be removed.

This method if of great value as a guide in directing forceps for the extraction of a foreign body. If the prolongation of the shadow of the instrument in both projections passes through the foreign body, the direction of the instrument is seen to be correct. If, however, the prolongation of the shadow of the instrument in one or both of the projections fails to pass through the foreign body, the direction of the instrument in one or both of the two planes is seen to be incorrect.

If, for instance, the operator is trying to remove a shrapnel frag-

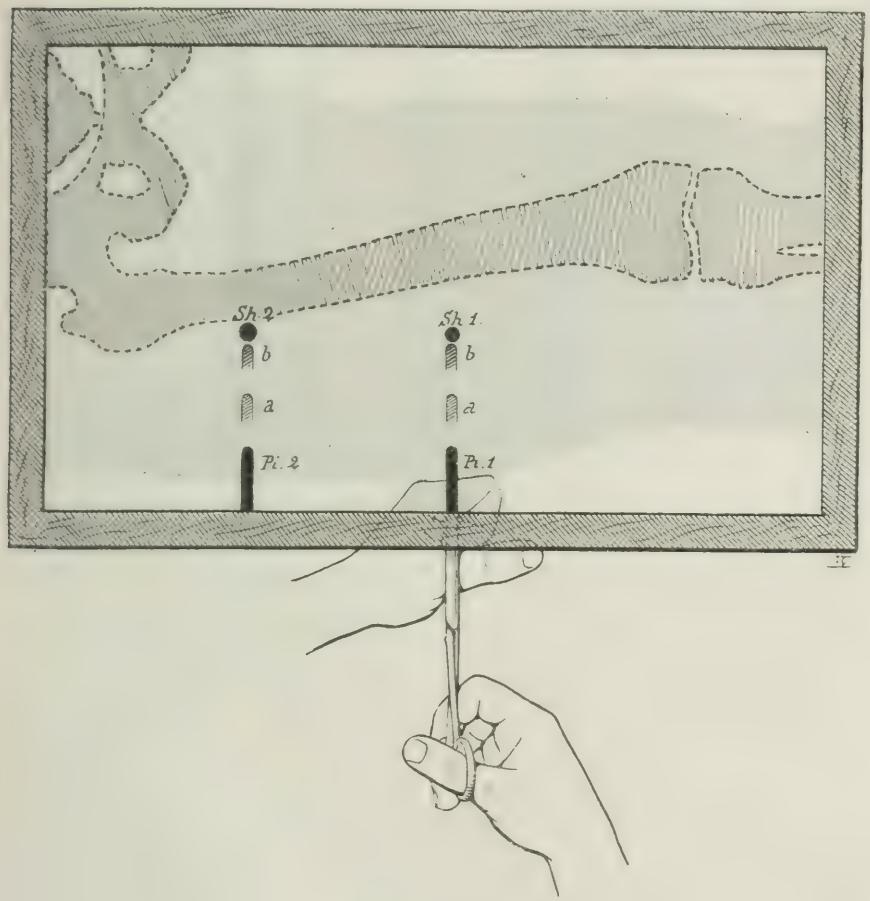


ment in the thigh, when the fragment can be reached from a plane



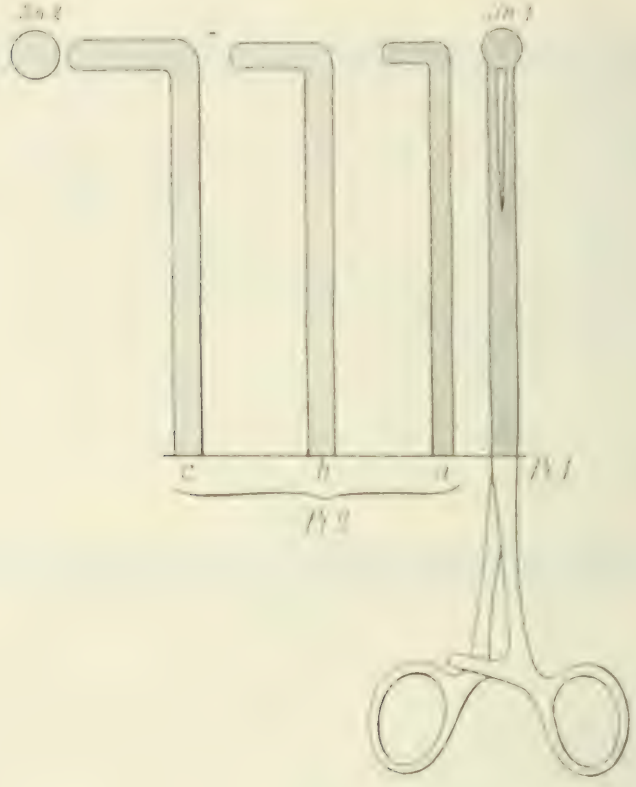
perpendicular to that of the rays, the forceps should be placed in

contact with the surface of the thigh. Two shadows of the forceps will then appear on the screen corresponding to the two shadows of the missile. If the prolongation of the shadow of the forceps fails in either or both cases to pass through the shadow of the fo-



reign body, the shadows may easily be made to take the right directions by moving the forceps until the correspondence is correct. Whether the penetration is horizontal or vertical, the principle remains the same, and the shadows of the foreign body should be made to lie in the line of prolongation of the direction of the instrument.

This method is also useful in determining the depth of the foreign body in simple cases. For this purpose a mark is placed on the skin at the point where the shadow of the end of the forceps produced by the vertical rays coincides with the shadow of



the foreign body. Another mark is then made at the point on the skin where the end of the forceps must rest when the shadows produced by it, if prolonged, pass through the shadows from the foreign body. The depth of the body may then be estimated in the vertical and transversal directions.

X-Ray Work in a Base Hospital in France: a Few Observations of a Practical Nature. By B. H. STANLEY AYLWARD, Captain, R. A. M. C. Abs. from the *Jour. R. A. M. C.*, May 1918.

In war work, the author considers rapidity in handling cases of prime importance. The worker must combine speed and accuracy, and deliver the patient to the surgeon with information given in the most practical manner possible.

The table should be arranged so that the patient need not be removed from the stretcher. A tube box should be placed under the table in such a manner as to be easily moved, preferably by the feet.

Some form of apparatus for taking lateral head plates is advisable. The author recommends such an apparatus devised by Major Higham Cooper.

When possible the foreign body should be clearly indicated by marks on the skin. Plates may be taken in addition if desired but the marks are more serviceable to the surgeon in ordinary cases. Three colors should be used in making the marks: green for antero-posterior, red for lateral, and blue for the nearest point to the skin.

The tube should be carefully centered so that the ray passes upwards through the exact center of the diaphragm.

It is usually best to make the lateral mark first, for the second antero-posterior mark often involves moving the patient. The blunt end of the marker is placed against the skin laterally opposite the foreign body at about the supposed depth. The tube is now moved longitudinally and the movement of the foreign body and the end of the marker compared. Finally a position is found where the end of the marker and the foreign body move together when the tube is moved. The ray is then produced and the point marked with red. An antero-posterior mark is then made in precisely the same way, but with the marker underneath the patient. It is usually necessary to turn the patient or to lift his limb in order to make this mark.

The practice acquired in judging whether the point of the marker is above or below the depth of the foreign body is very useful in the removal of bodies under the rays.

Foreign bodies lying deep in the trunk are best marked either on the back or front in the antero-posterior position, and the depth then worked out by stereoscopic plates.

In head cases antero-posterior and lateral plates are usually sufficient, but it is often difficult to determine from them whether the foreign body is in the skull or not.

For eye localization the author recommends an apparatus evolved from Major Cooper's head apparatus. This is used in connection with circular marker.

MEDICINE

A Rapid Method for the Determination of Pneumococcus Types. By O. W. H. Mitchell and Walden F. Muns. College of Medecine, Syracuse. Abs. from the *Journal of Medical Research*, Nov., 1917.

The authors offer a more rapid method of distinguishing pneumococcus types because methods now in use are too slow to make early recognition possible. Early differentiation is especially desirable since only the immune serum for Type I pneumococcus is of practical value.

The test devised consists in the detection of precipitinogen, derived from the pneumococci in the sputum. By this method there is no such delay as in the use of a mouse or in the securing of a culture. Type I may generally be recognized within an hour or two.

Results thus obtained in the laboratory have proved accurate. They have been checked by mouse inoculations.

Technique. — The sputum (5 cc.) is pipetted into a small mortar. Fine sand is added until a stiff mixture is obtained. The mixture is then ground for about three minutes until a gritty fluid paste results. 10 cc. of normal saline are added, two at a time. After thorough mixing, the sand is allowed to settle. After three or four minutes the dissolved sputum collects over the sand and is pipetted off into a centrifuge tube. A second fluid is obtained by mixing about 10 cc. of normal saline solution with the sand in the mortar and pipetting off into a centrifuge tube. This may be reserved for use in case of accident. Both solutions are centrifuged for from 5 to 10 minutes at 2,200 R.P.M.

Positive results have thus far been obtained from tests made with Types I, II, and III of anti-pneumococcic serum, furnished by the Division of Laboratories and Research, New-York State Department of Health. In testing for each type, 0.2 cc. of the serum is mixed with 1.0 cc. of the sputum solution. The tube should be carefully shaken and placed in a water bath held at 37° C. Many

of the reactions appear almost at once, especially that of Type I. The mixture first appears slightly opalescent with a faint smoky "whirl" on shaking. (The "whirl" is due to finely divided particles of sputum.) The disappearance of the "whirl" seems to be the first indication of specific reaction. A very slight feathery precipitate may then be detected with the naked eye. With a lens this precipitate may sometimes be seen within a few minutes after the mixing. The feathery white flakes tend to drift to the bottom of the tube, where they collect in a typical white mass.

In a negative test there is no reaction of any kind and very little sedimentation. If sedimentation occurs, it appears as a nebulous grayish cloud at the bottom of the tube, remaining partly in suspension. Precipitate from specific reaction, upon shaking, breaks up into large particles, but sedimentation, when shaken, disappears through the fluid.

After two hours in the water bath, the tubes may be set away in the ice-box. Generally there is no reaction after three or four hours.

Sputa from 36 cases of well-developed pneumonia were examined. Although pneumococci of Type IV were isolated, no reaction could be obtained by any of 7 tests. Positive results were obtained in only 1 out of 4 tests for Type III. For Type I, however, positive results were obtained in 18 out of 19 tests. The 4 cases of Type II all gave positive results.

The Cerebrospinal Fever Epidemic of 1917 at "X" Depot. By J. A. Glover, R.A.M.C. Abs. from the *Jour. R.A.M.C.*, January, 1918.

The author reviews the history of meningitis at his dépôt, emphasizing especially the relationship of the carrier rate[1] to the epidemic prevalence of the disease.

Type II meningococcus was responsible for most of the cases.

All cases occurred during exceptionally cold weather and in periods of undue crowding.

The rise in the carrier rate, as indicated by swabbings, was a premonitory sign of the outbreak of the disease. The danger rate, 20 per cent. (War Office Memorandum on Cerebrospinal Fever, p. 2) was reached six days before the first case occurred.

During the epidemic, the carrier rate among contacts and non-contacts was practically the same (about 34 per cent.).

1. See *Medical Bulletin* No. 5, March, 1918. Gordon's discussion of the [illegible]

The use of the Levick spray for steam zinc sulphate solution, brought about a satisfactory drop in the carrier rate and a temporary cessation of cases in each instance.

The author points out, furthermore, that many of the patients (about 60 per cent.) were in their first month of service and that 40 per cent. had been inoculated or vaccinated within seven days of the onset (three on the same day).

Epidemics of German measles, influenza, and bronchitis appeared to help in the distribution of the disease, partly by coughing and sneezing and partly by reducing the vitality of the patients.

The author outlines the measures of prophylaxis adopted in 1918. In August the carrier rate fell to 2 per cent. thus affording the best opportunity to begin prophylaxis.

The measures adopted are:

1. Spacing beds (minimum interval 2 1/2 feet).

2. Special ventilation.

3. During the danger months (December, to March) antityphoid inoculation is done in the second month and vaccination during the first month.

4. A spray chamber has been established equipped with an external boiler and 20 Nines jets, thus obviating the disadvantage of the Levick spray.

5. Each regiment is sprayed in rotation every day for six days once a month, whenever there is a serious rise in the carrier rate. Recruits are sprayed for six days upon arrival.

6. A large sample swabbing (100 men) is taken weekly.

Intravenous Injections of Quinine for the Treatment of Primary Paludism By P. Cagnot and A. de Kerdrel. Trans. and Abs. from the *Paris Medical*, Vol. XXIII, p. 2.

The authors state that in spite of strong and prolonged dosing with quinine, administered through the digestive and interstitial tracts, many of the cases of paludism evacuated from the Orient to France remain badly infected.

The method of Bacelli, for complications during the first month, has given better results than any other means of absorption.

Technique of Intravenous Injections of Quinine. Urethane quinine is practically the only solution employed. Used interstitially, this is less painful, less caustic, more quickly absorbed than the other solutions of quinine.

Ampoules are prepared containing the following ingredients:

Basic chloro-hydrate of quinine	0.40 gr.
Urethane	0.20 "
Distilled water	1.00 cc.

For intravenous injections each ampoule is diluted in 22 cc. of physiological saline, bringing the total of quinine in the solution down to 2 per cent. In serious cases good results have been obtained by injecting with the diluted quinine solution, a certain amount of physiological serum. The total of dilution is reduced to 1.6 or 3.2 per cent.

Intravenous injections of quinine must be made slowly at the rate of 20 cc. of saline plus 0.4 gr. of urethane quinine in 5 minutes.

Pernicious Complications. Serious complications resulting from severe infection may severely affect the nervous system and the suprarenal, hepatic, or renal glands. These are sometimes generalized and sometimes confined to the nervous system, the liver, and the kidneys.

Generalized forms. Complications resembling typhoid. The dynamic attack is not the first manifestation of paludism. Earlier signs determine the diagnosis. Temperature, taken every three hours, shows considerable variation. The spleen is usually much more enlarged and painful than in typhoid. Blood examination by smears reveals numerous merozoites and crescents. If this result is not obtained from the peripheral blood, it may be observed in the visceral blood. It is an indication of serious paludism.

A large intravenous injection should immediately be given. Two injections of 0.40 gr. with an interval of a few hours may be preferred to one large one of 0.80 gr. diluted in 20 cc. of saline.

In such cases, the best results have been obtained.

Nervous manifestations (delirious, algid, comatose, hemiplegic, epileptic, etc.) Serious and alarming symptoms often result from the generalized infection or its localization in the nervous system or meninges. Death appears to be imminent. Intravenous injections of quinine is indicated in such cases.

Intravenous Serum Treatment of Epidemic Cerebrospinal Meningitis. By W. W. HERRICK, M. R. C. Abs. from the *Archives of Internal Medicine.* April 15, 1918.

The author believes that the meningeal aspect of meningococcus infection has attracted general attention to the neglect of other important considerations, especially the point that meningococcus

infections are primarily septic in nature and that meningitis is merely a secondary complication. The premeningitic stage of the sepsis especially has been neglected. In this stage, the author believes, lies the key to early diagnosis and treatment.

The author reports 208 cases in about half of which primary meningococcus sepsis was observed before selective action on the meninges was established. Intravenous serum therapy was thereby placed on a firm basis, with a notable reduction of mortality. Men with any suggestive symptoms were at once removed to a special hospital as suspects, and so the early stages of the disease could easily be studied.

The early symptoms are those of a generalized infection. This stage averages about 48 hours but may be much longer or shorter. The evidences of this stage are (1) clinical and (2) bacteriological.

Clinical symptoms. — Fever rarely rises above 102° F. (generally ranging from 99° to 101° F.). The pulse is slow with vagal irregularities. There is a characteristic attitude, manner, and facies. The patient is not irritable. He resist, prefers to be left alone, lies on his side with thighs and knees drawn up, and shields his face with a covering. He is sensitive to cold and resents exposure. The patient avoids all effort even in speech. He has a vacant look of apathy and dulness.

The veins of the temporal region and forehead are full, the eyeballs are tender, and cyanosis of the face is most common; especially noticeable in the margins of the ears, often with a sharp line of demarcation. The pupils are almost always dilated. Some cases show retinal edema and obscurations of the disk margins and fulness of the retinal veins.

In many cases there is an upper respiratory tract infection, a coryza, pharyngitis, tonsillitis, laryngitis; rarely, bronchitis. In four cases a pneumonia was observed. This respiratory involvement is not a mere coincidence, but demands serious study. Oral secretions are viscid, the tongue coated, and the breath heavy.

Skin manifestations are most important. Very early there may be a more or less diffuse mottling, giving a lead-colored appearance. *Tache cérébrale* is constant but of slight diagnostic value. Macular rash resembling early chicken pox or rose spots has been observed in a few cases, generally of the less severe type. The predominant skin sign was the petechial rash about the shoulder or the pelvic girdle, and less frequently over the trunk, extremities.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

War Injuries and Neuroses of Otological Interest. By Dr. C. E. Jones-Phillipson. *Journ. Laryn., Rhin. and Otol.*

Jones-Phillipson, while in charge of the ear cases for the Third Army of the British troops, made notes of 1172 cases. He analysed 100 cases of war injury of the ear, all of which were seen within 24 to 36 hours of their coming out of the trenches. There were 31 cases of laceration of the external ear : in the antero-inferior quadrant in 20; in the postero-inferior quadrant in 6; in the inferior quadrant in 1; in the umbo in 2; in the posterior quadrant across the two in 1. The lacerations usually healed well and quickly.

He made notes of 100 cases who definitely attributed their deafness, or increased deafness, to the effects of " guns, " " explosions, " " bombardment, " and " being buried ". 70 per cent of them showed pre-existing ear, throat and nose conditions : defects due to otitis media suppuration, 34; defects due to C. D. C., 22; defects due to nose and nasopharynx, 17.

The patients with ear injuries complained of the following symptoms, in order of frequency :

(1) Deafness, increased deafness, " dulness in ears. "

(2) Noises in great variety (singing, buzzing, hissing, straining, thumping, bells, throbbing, ticking).

(3) Giddiness, dizziness, " dazed ".

(4) Pain — soon passing off.

(5) Bleeding, at the time, or noticed soon after.

(6) Staggering gait, inability to walk, unconscious, dumbness, blindness.

Deafness was very marked soon after the explosion, always most on the side exposed to the full force; when the shell burst in front or behind a patient, both ears were affected. Patients who had been buried seemed to have suffered more than others. The initial degree of deafness following the concussion soon passed off. The noises were often noticed only later, after the first degree of deafness had passed off. It was not often that increase in deafness was stated; as a rule, only the addition of noises to the previous condition. When the hearing showed further marked improvement, the persistence of the noises was a common complaint. Some pa-

tients reported being unconscious for from one to two hours; then feeling in a dazed condition, inability to walk unassisted, staggering gait; others that they lost the power to speak, or could not see. All these maximum conditions appear to pass off quickly; the lesser conditions, giddiness and dizziness, were complained of for seven to ten to fourteen days — anyway while under observation. These cases showed a horizontal or rotatory nystagmus, or turning eyes to the right or left. It must be noted whether both right and left sides were likely to have been affected at the time, or right or left only. It will be noticed that when both sides are affected there was a nystagmus to the right and left; when one side was affected there was a nystagmus to the opposite side.

From his study of this series of cases Jones-Phillipson concludes that shell-concussion deafness is to a large extent temporary and curable. He thinks that shell-concussion deafness is probably due to three contributory factors:

(1) Cerebral concussion.

(2) Overstrain and fatigue of the organ of Corti; the former being due to violent oscillations of the perilymph communicated to the organ of Corti, and the latter to continuous violent noises or explosions at close quarters.

(3) Temporary or permanent disorganization of the conductive apparatus.

The prognosis depends on the recovery of these parts.

(1) The patient experienced a great shock, and was, in many instances, buried. He became suddenly deaf, and often dumb also. In other cases, he could not see, or had paresis of arm, leg, or both legs. Here the higher centres were temporarily involved. One watched the almost sudden improvement in hearing in a few days as shock passed off, and the disappearance of nervous symptoms generally when the patient was removed from the firing line.

(2) A portion of deafness remains to be more or less slowly recovered from by the return of the internal ear to a normal or nearly normal condition.

(3) Structural damage must leave a permanent imperfection of function — a ruptured membrane; a dislocation, partial or complete, of the small bones from one another, or the stretching of their attachments to the tympanic wall.

The Pathology, Diagnosis, and Treatment of Absolute Hysterical Deafness in Soldiers. By A. F. Hurst, Temp. Major, R. A. M. C., and E. A. Peters, Temp. Capt. R. A. M. C. Abs. from *The Lancet*, Oct. 6, 1917.

Hurst and Peters report two cases of complete hysterical deafness which had persisted for months in spite of treatment by the usual methods of suggestion, electricity, and efforts at reeducation. The deafness continued during natural sleep, since it was impossible to awaken the patients by loud noises; and even when hypnotized no sounds made any impression on them. All the usual tests for malingering were tried without any evidence that a sound could be heard, yet there were not the organic changes usually found in complete deafness. All the usual methods of treating hysterical deafness having failed, they were told that an operation on the ear would certainly cure them. A little ether was given and two incisions made behind the ears, an iron plate being continuously hammered at the same time making a loud noise near the ear. The reaction was the same with both patients — each jumped from the table when coming out from under the influence of the ether. Normal hearing returned to both in a few minutes after "operation", and though months have elapsed the deafness has not returned and they have taken up their work in France.

After the report of the two cases the authors discuss the etiology, diagnosis, pathogenesis and treatment of hysterical deafness. Regarding etiology and pathogenesis they say:

The momentary deafness which is the natural result of the terrific noise caused by the explosion of a big shell in the immediate neighbourhood may make such an impression on the mind of a soldier that on coming to himself, whether he has actually lost consciousness or not, his first thought is for his hearing, especially if it was already impaired by preceding disease, and he may be so convinced that he is permanently deafened that he becomes actually deaf as a result of auto-suggestion. The temporary deafness which occurs in gunners from the effect of the constant repetition of very loud noises may in the same way become perpetuated and exaggerated by auto-suggestion. Organic deafness, especially if the onset is acute, as in that due to involvement of the auditory nerve trunk in cerebro-spinal fever, may remain complete after the disappearance of the active inflammation has been followed by restoration of some of the nerve fibres, so that a certain amount of hearing should have returned. This, again, is due to auto-suggestion, the final deafness being organic with a superadded hysterical element.

which is capable of removal, like all hysterical symptoms, by suggestion.

Hearing necessitates listening. Inattention during a dull sermon results in total deafness to the sermon, and in hysterical deafness the patient is so convinced that he cannot hear that he does not listen. Although the sound vibrations reach the ear in the normal way, they do not give rise to the slightest auditory sensation because of this inattention. The synapses at one or more of the cell stations in the auditory path to the cerebral cortex must, therefore, be unswitched, probably as a result of retraction of the dendrons. In absolute hysterical deafness the auditory motor reflex, which is a function of the mid-brain, may be abolished or greatly diminished. One of the unswitched synapses must, therefore, be below the mid-brain and either in the auditory nucleus or else probably in one of the intermediate cell stations — the superior olive or the nucleus of the lateral fillet. The persistence of the deafness during hypnosis and natural sleep shows that during the prolonged inattention of hysterical deafness which has lasted for a considerable period the unswitching of the synapses is more profound than that which normally occurs during deep sleep, in which the synapses can always be forced by a loud noise.

The diagnosis is made from (1) the history; (2) quantitative tests for air and bone conduction — the watch test for air and the modified Schwabach test for bone conduction; (3) auditory motor, or jump, reflex; (4) persistence during sleep; (5) effect of hypnosis; (6) changes in the voice; and (7) the vestibular reaction.

They state that uncomplicated deafness is the most difficult of all hysterical symptoms to treat; mutism is one of the easiest. It is therefore fortunate that most cases of hysterical deafness are associated with mutism, as the return of speech in a deaf mute generally convinces him that he can also hear, especially if he has been told that this will be the case. He listens as soon as he finds he can speak, and the unswitched synapses are once more switched on.

Their methods of treatment consist of suggestion with the aid of cold or hot baths. The majority of cases of hysterical deaf-mutism were cured by the introduction of an intralaryngeal electrode without switching on the current, informing the patient that the application of electricity to the vocal cords will surely restore speech. Many hysterical deaf-mutes will talk when coming from under the influence of ether. After speech has returned it is then easy to persuade the patient that he can hear. The results from the two operations give encouragement for the cure of the

cases of uncomplicated hysterical deafness that hitherto have resisted the usual methods of treatment.

Treatment and Training of the Deaf Soldier. By DUNDAS GRANT, Major, R. A. M. C. Abs. from the *Recalled to Life*, April, 1918.

The author states that his aim with regard to the blind has been to put them in the way of providing against poverty and privation, whereas in dealing with the deaf, he has aimed to restore to them the power of understanding and communicating with their fellows.

Lip reading is by far the most practical means of putting the deaf man into social communication with others and of making him eligible for a large number of occupations.

Such instruction is given in Paris at the Institution Nationale des Sourds-Muets in the rue Saint-Jacques. The system seems to have been started at Lyons, the chief center of the XIV th region. There is also such instruction at the convalescent hospital in Bordeaux. In talking with some of the patients in the institutions, the author noticed that it appeared more difficult for patients who knew both English and German to understand English than it was to understand German. This difficulty, he believes, was due to the restricted lip movement in English. A patient detected the author's foreign accent in French, but he could understand all that was said.

Mr. Haycock states that lip-reading with a free use of the blackboard is the means of communication in his classes in Edinburg, and that in private conversation writing on paper takes the place of the blackboard. The amount of writing necessary varied with individuals. All of the patients objected to using the finger alphabet.

A mental attitude of freshness and cheerfulness is of great importance, and therefore a vivacious and sympathetic manner is a requisite in any teacher. Lip-reading requires very great mental concentration and hence requires that the pupils should come to their lessons fresh, and that they should be provided in the meantime with light and agreeable recreations. The first lessons are the most trying, for until the patient gains some ease in lip-reading, the mental strain is very great. Many of the patients are not at all accustomed to such intense mental activity.

NEUROLOGY

War Neuroses and Psychoses. Capt. CLARENCE B. FARRAR. *American Journal of the Medical Sciences*, March 1918.

The author thinks that it may be useful to distinguish the following conditions :

1. Simulated malingering. — This refers to certain pathological mental states with partial or complete irresponsibility.

2. Exaggeration and Perseveration. — Perseveration means the indefinite continuation of symptoms after the original cause has subsided.

In conditions accompanied by pain perseveration may extend over many months, with no discoverable basis.

3. Hysterical Autosuggestion. — In this it is unnecessary to assume any organic lesion whatever underlying the symptoms presented.

4. Mental Contagion. — In its simplest form it amounts to nothing more than purposive collusion or limitation.

Less directly conscious imitation is notoriously effective in the production of neurotic symptoms.

5. Voluntary Fabrication. — These simulated conditions include fictitious skin eruptions, abscesses and ulcus; contusions, erythematous infiltration from self-inflicted blows repeated at intervals; self-inflicted bullet wounds and so forth.

The principal mental diseases encountered in the service are :

Dementia Precox. — Slowly developing psychosis : apathy, inertia, defective sense of personal identity, aural hallucinations purposeless impulsive (often dangerous) acts.

Recognition of the psychosis may be delayed by a practically complete remission of symptoms, which may thus lend weight to the suspicion of malingering.

Manic-depressive Psychosis. — Characterized by recoverable phases of emotional depression with feeling of incompetence and varying degree of inhibition in thought, speech and action on the one hand, and exhilaration, hyperactivity and talkativeness on the other.

Paresis and Taboparesis. — In paresis, brain involvement and mental symptoms are foremost.

Epilepsy and Epileptiform States. — There are other symptoms of epilepsy besides convulsions which may cause trouble : dizzy

spells, fits of irritability with violent acts, states of clouded consciousness with amnesia.

The chief epileptiform seizures are :

Genuine epilepsy, post-traumatic epilepsy, hysteria, alcoholism, paresis, arteriosclerosis and brain syphilis, brain tumor, meningitis, and malingering.

Primary Mental Defect. — High degrees of feeblemindedness are easily overlooked by medical boards dealing primarily with physical conditions, but it is well to remember that inattention, forgetfulness, failure to execute orders, erratic and unreliable conduct may sometimes be traceable to this cause.

Psychopathic Constitution. — Constitutional psychopathes are victims of unstable or inharmonious mental development. While judgment defects in particular directions may be conspicuous, they are, in a general way, clear and rational. Once the situation is recognized these men are better eliminated from the service with as little delay as possible.

Neurotic Reactions. — Their primary causes are endogenic.

The neurosis, however, like all purposive conduct, is more specifically a reaction to a given situation. On the other hand, it must not be overlooked that the majority of cases develop in men *constitutionally predisposed*.

Psychogenic factors are generally conceded to be fundamental in the development and perpetuation of war neuroses.

Now it is a striking fact that severe physical trauma and neurosis are, as a rule, mutually exclusive. This applies especially to injuries of brain or cord.

Furthermore, severe neuroses may follow not only concussion from high explosives but also other injuries and diseases, and may develop in men who have never left camp or suffered from any definite illness or accident.

Finally it has been shown that neurotic conditions are relatively more frequent in hospitals distant from the front than in the field hospitals themselves.

Types of War Neuroses. — In the trenches the primordial emotion of fear appears to be universal and physiological, at least as an initial or episodic mental state.

The symptoms may be practically all classified under two headings : neurasthenia and hysteria.

The complaints of neurasthenics generally are multiple, often vague and changeable. At the same time dominant symptoms are so commonly associated with particular organs that we may conveniently speak of the group of *somatoneuroses*.

Somatoneurotic reactions may be : 1) respiratory, 2) cardiac, 3) gastro-intestinal, 4) excretory, 5) musculo-articular.

Hysteria develops, as a rule, abruptly and spectacularly, and oftenest in men young in years and young in service.

Sensory Disorders. — Hysterical blindness and deafness are usually sequent to concussion associated with lesions of the sense organs. Pain reactions of all kinds are usually met with. Cutaneous anesthesia of familiar hysterical types is not uncommon, and often accompanies functional motor disorders. Motor disorders of psychogenic origin include derangement of the speech mechanisms; tics; general trembling, tremor of extremities, choreiform movements; myoclonus; epileptiform convulsions, rhythmic movements, and contractures of all description.

A special type of functional contracture is trench spine.

Psychic Disturbances. — In concussion cases a stuporous state may persist for several days, furnishing the cue for continuing individual symptoms and episodic conditions such as dream-waking, hallucination, hallucination automatism. Loss of memory is a favorite complaint of war neurotics, but cooperation is not always of the sort to make memory tests of value.

Treatment. — It should be started promptly and carried out rapidly and determinedly. There should be as little relaxation of military discipline as possible. For certain shock symptoms, a counter-shock may be all that is required.

A new mental attitude and a new way of self-management should be aimed at to ensure the after condition of the nervous invalid.

Finally it would seem highly desirable to incorporate in the system of training a certain amount of information concerning war neuroses and to teach mental hygiene as well as physical.

The So-Called Functional Symptoms in Organic Nerve Injuries. By J. S. B. Stopford. *The Lancet*, June 8, 1918. p. 795.

The author shows that patients with undoubted injury of a peripheral nerve, who also exhibit functional symptoms, may not only, as Babinski has suggested, have them produced by faulty treatment at the front; but also by medical suggestion, or as the author' suggests, by an emotional disturbance due to prolonged strain before being wounded.

He divides these mixed cases into two groups: (1) Cases in which the functional element predominates and where the case is called hysterical and where the organic defect is overlooked. (2) Cases in

which the organic symptoms are more apparent. Here there are less chances of error in diagnosis in this group which is the predominant.

In patients with mixed symptoms thermalgesia occurs most frequently, and the author has uniformly found evidence of an irritative nerve lesion. Pain is a practically constant premonitory symptom of an irritation when it precedes the onset of the purely functional paralysis uncomplicated by external wounds. Unsatisfactory results of the treatment of the functional part of the syndrome are encountered if the irritative lesion was not rectified previously.

In practice it is found that the functional cases, which fail to react to treatment, or soon relapse, are the ones in which the organic part still persists. Trauma therefore plays a much less inconspicious part in the production locally, and in the persistance of functional manifestations, than it is usually considered to do and it appears to be the exciting cause, though not the only one.

There seems little doubt that the predisposing cause is of psychogenic origin, as exposure to the conditions of modern warfare is liable to promote psychic exhaustion to which strain some subjects will react more readily and more profoundly than others. Men who have previously exhibited definite hysterical symptom will react to this strain and are predisposed to suffer again from functional disturbance at an early date.

Toxaemia, insufficient nourishment, or loss of sleep, influences the reaction of an individual to psychic exhaustion and even under these circumstances the most stable might be thrown into a state predisposing to functional disturbance. Treatment must be rational and directed to all possible factors in the production of these conditions — i. e. the greatest patience and diligence must be shown in attempting to discover as a preliminary measure whether a source of irritation exists and if so, to treat it before treating the functional part. The psychic side is then easily relieved and then cured.

A New Reflex Sign in Spastic Paraplegia. By Dr. Robert Bing. *Corresp.-Blatt f. Schweizer Aerzte.* April 13, 1918.

Bing calls his new sign the paradoxical ankle reflex. He discovered it first in a case of syphilitic hemiplegia and later established its constant occurrence in organic spastic conditions involving one or both lower extremities.

It is produced in the following way : With the patient on his back, the affected leg is put in the usual position for testing ankle

clonus being moderately flexed at hip and knee. The examiner's hand brings the foot into moderate dorsiflexion with consequent slight tension on the Tendo Achilles while a sufficiently heavy percussion hammer is employed to strike the dorsum of the foot at any point along the imaginary line joining the malleoli. In positive cases there results an immediate contraction of the gastrocnemius and a corresponding flexion of the foot at least as marked as is usually obtained for the ordinary ankle—Achilles-jerk. The test is easy to elicit and is of unequivocal significance. It is immaterial whether any particular tendon of the extensor group including the tibialis anticus, extensor proprius hallucis and communis digitorum is struck or not. In negative cases no movement results or else simply a weak extension or dorsiflexion.

This reflex belongs to the group of inverted reflexes where percussion on the extensor side of the limb is followed by contraction of the flexors or vice versa.

The paradoxical and inverted reflex of Piotrowski, in which percussion of the belly of the tibialis anticus produces a smart plantar flexion of the foot. He has found this reflex present in four cases where the other more commonly elicited reflex signs of organic spasticity from cortico-spinal impairment were apparently absent.

Complications of Wounds of the Spinal Cord. By GUSTAVE ROUSSY. *La Presse Médicale*, March 2, 1918.

One of the chief facts learned from the study of spinal cord lesions is that the prognosis often depends more on the complications than on the medullary lesion itself. Very noteworthy improvements are possible in these cases where grave complications are avoided. The latter occupy the first place as a cause of mortality.

The author finds that meningo-myelitis is rarely found, that it is possible to avoid the occurrence of bed-sores, which he does not considerer to be a trophic disturbance of essentially medullary origin. He finds that pleuro-pulmonary complications are very frequent and constitute one of the principal causes of death in wounds of the spinal cord.

It was formerly thought that in these cases death from purulent meningitis or meningo-myelitis was a frequent cause of death but the author's experience has been quite the opposite. He finds at autopsy meningitic lesions perfectly delineated near the point of the wound—that a reaction of defense has been set up in the form of fibrous adhesions, which oppose the extension for any great

extent from the inflammatory lesion. In other words, in the immense majority of cases there are not the local infectious complications which aggravate the prognosis of war wounds of the spinal cord, but rather the infective visceral complications such as the pulmonary complications.

He deprecates and deplores the death soon after operation, in cases with large wounds of the spinal cord where the operation took place the first few days after the injury. He thinks that these patients are still in a state of shock and resists with the greatest difficulty general anaesthesia, or even surgical intervention under local anaesthesia. As long as there is a good tolerance for foreign bodies in the intramedullary region of the cord, and a fibrous defense reaction is forming, he is in favor of waiting for the shock to pass of.

Bedsores are without doubt one of the gravest dangers which menace the patients with a spinal cord wound, but they can be avoided in most cases or at least arrested in their extension if they are treated as they occur.

The factors most potent in the causation of bedsores are prolonged compression with the attendant difficulty in circulation at the seat of the compressed joints— both due to the fact that it is impossible for the patient to change his position without assistance. Roussy does not consider the decubitus as a trophic disturbance of central medullary origin; but as a trophic disturbance of local origin, a result of mechanical disturbance, and of chemical irritation of the skin due to chemical changes caused by the dejections, and favored by the diminution of resistance of the skin because of the medullary lesion and the general state.

A patient with a wound of the spinal cord who has no loss of sphincter control should not have bedsores. A patient who has incontinence of urine will suffer fatally from this complication if proper, rigorous hygienic measures are not taken from the moment of injury.

In lesions of the chorda equina there are practically never any bedsores when there are no sphincter disturbances.

From the point of view of prophylaxis he takes steps to prevent bedsores by the following method :

It is indispensable to change the position of the patient hourly during the day and several times during the night. The physician or his assistants should themselves rigorously examine the patients daily to see whether or not their instructions have been punctiliously carried out. Air mattresses are indispensable for these patients as rubber rings give bad results causing bedsores

over the trochanters from lateral pressure. Suspension beds are also defective.

The skin should be given an alcohol lavage daily, followed by complete drying and then powdered with talc or Lucas Championnière's powder.

Absolutely avoid soiling the skin by faeces or urine which are the principal sources of local infection. It is sometimes difficult to protect the skin from contact of faeces because there often exists a diarrhoea. Roussy, therefore, suggests in these cases that before transporting them, opiates should be given to cause constipation.

The factors favoring pleuro-pulmonary complications are many — those especially potent being, that the patients bear transportation very poorly even for a short time or for a short distance; and they are particularly sensitive to cold. In any case prolonged decubitus favors hypostatic pneumonia. When a patient lies for a long time on one side pulmonary lesions predominate on that side.

Frequent examinations of the chest are necessary, particularly when the patient presents any fever, either with or without cough.

Clinical Aspects of Hemilesions of the Cord. Leading Article. *N. Y. Med. Jour.* Dec. 22, 1917.

In this war medullary hemisections, properly speaking by sharp edged instruments are relatively rare, while pathological lesions are rather frequent. Severe, direct, or indirect traumatism, e. g., fracture of the vertebrae with bone splinters, dislocation of the spine, with or without fracture and incomplete dislocation, are the causative factors.

Sudden inflexion of the spine from some violence, or its forced rotation, falls upon the knees, from a considerable height, or on the feet or buttocks, or a heavy weight falling some distance and striking the spine, may result in hemilesions of the cord.

Other conditions which may result in the Brown-Sequard syndrome are : periostitis, osteitis, arthritis, exostoses, enchrondromata, extra- or intrameningeal haemic collections whether the blood be coagulated or not, the myelitides and various meningitides, the late lesions of lues, benign and malignant neoplasms, hematomyelia, aortic aneurysm which has eroded the spine, etc., etc. All reported cases of those not experimentally produced are comparable. In hemilesion a double symptom dominates, viz : a motor hemiparesis with hyperaesthesia of the corresponding side and a superficial hemi-anaesthesia with preservation of movement on the opposite side.

The sensorimotor disturbances can be classified under four headings :

(1) Motor paralysis limited to the lower limb on the side of the hemisection. Sensory disturbances do not reach the root of the limo. The Cord is involved below the level of the ninth dorsal vertebra.

(2) Motor paralysis and sensory troubles extend above the roots of the lower limbs and involve a portion of the trunk. Cord involved between the middle and upper dorsal vertebrae.

(3) The upper limbs and thorax participate in the sensorimotor disturbances. Frequently get manifestations in relation to a paralysis of the great cervical sympathetic, and pneumogastric nerves. Cord involved at a level above the sixth cervical vertebra.

(4) Motor and sensory troubles invade an entire half of the body up to the face, the throat and the neck included. Cord involved at its upper portion just above the occipital protuberance. Importance is placed in the fact that in man, in traumatic hemisection of the cord Brown-Sequard's syndrome may only develop after a lapse of time while at the beginning a motor paraplegia, or even tetraplegia predominates.

(5) Hemilesions of the cord. Generally speaking, when the hemilesion does not involve the cord at its upper end, life is rarely endangered. Here the functional disturbances tend to improve progressively. Of the primary symptoms, paresis of some of the muscles, trembling of many, and slight changes in sensibility traces will be retained.

Microscopically, regeneration of the nerve elements has never been detected and in man return of functions has occurred in cases in which there has been no regeneration. This return of function is undoubtably due to compensation on the part of the cord which has remained intact or by an intercrossing of the motor fibres throughout the entire length of the cord.

HYGIENE

Hygiene of the Camps and Cantonments of an Army. By P. NOBÉCOURT, Médecin-Major de 1re classe. Trans. and Abs. from the *Presse médicale*, June, 10, 1918.

The author reviews the progress made in arrangements for comfort and hygiene in camps and cantonments since the outbreak of the war. At first this branch of the service was necessarily

neglected in the endeavor to provide adequate hospitalization, but at present hygienic installations are numerous and defective arrangements are rare.

The program for rendering camps and cantonments *clean* and *comfortable* includes the *cleaning* of grounds, buildings, kitchens, and sanitary arrangements; the proper closing, ventilation, and heating of *lodgings*; the *furnishing* of indispensable articles of comfort, the providing of agreeable *meeting places*; the installing of well-kept *infirmaries* and facilities for *personal hygiene*, and the providing of *pure water*.

Sanitation of the grounds is one of the first and most difficult requirements. Places are designated for the deposit of manure, refuse, etc., and the accumulation is removed daily, if possible, to a place remote from the camp. To rid the camp of flies, the manure heaps are sprayed with a 3 per cent. solution of cresyl. The grounds should be graded to permit of proper drainage, and all holes and depressions should be filled in. Streams should be cleared, and where necessary canals dug. Special pains should be taken to allow the water from wells, fountains, wash-places, baths, kitchens, etc., to drain off.

The ideal situation for a camp is a gentle slope towards the south or south-east. Camps in a hollow are difficult to maintain in a good state of sanitation.

Roadways should be kept free of mud and dust, and should be sprinkled in the dry seasons. Stone and log roads are constructed for the pack-animals, and paths with proper flagging for the men. Mud is a great enemy, not only because of its filth, but also because of the constant wetting of feet.

Proper arrangements for the disposal of manure and refuse should be made near the cantonment, including an incinerator. They should be so placed that the prevailing wind will carry the odor away from the camp. They should be situated on dry ground, and distant from water supply and streams.

Manure should be placed in regular piles with evaporating canals to prevent the spread of the liquids. In summer the piles should be covered with earth to prevent the increase of flies, or, if this measure is insufficient, they should be sprinkled with a 3 per cent. solution of cresyl or a 10 per cent. solution of iron sulphate (sulfate ferrique).

Things worth saving from the dumps are put aside and treated according to their nature. Old clothes are sprayed with the Vermorel apparatus using a solution of cresyl. Bones are buried in a pit, with light layers of dirt over each deposit.

Organic detritus is deeply buried or burned, the latter process being preferable. Incinerating furnaces are easily constructed with stones or bricks, or by digging into a bank.

If these measures do not suffice to avoid fly and rat pests, other means like poisons and rat-dogs may be employed.

The drying of all ground in the neighborhood of a camp helps to rid the place of mosquitoes and to prevent malaria.

The construction of proper *latrines* is of prime importance. At first, the holes dug were too small, with the results that they were soon filled and the men obliged to defecate elsewhere. They are now dug very deep, and strict discipline is maintained in the care of such places. Disinfectants are freely used, and men are required to cover their stools with layers of dirt. Every effort is made to render them confortable and private. In summer a small quantity of coal-tar mixed with iron sulphate (sulfate ferrique) is spread each day over the deposite to prevent the accumulation of flies. The pits should be covered with earth before they are filled and the superstructure moved to a newly dug trench.

The use of metal receptacles is very awkward and should be resorted to only when the ground is too swampy to permit of pits or when the conditions of service require their use.

The *maintenance of lodgings* is a difficult and varied task, but requires the utmost thoroughness and care. It is difficult to do much in this particular during times of stress, but behind the lines, all places of habitation may, at least, be kept in good condition. Rough buildings like barns, should be improved by the construction of walls and ceilings, and every facility provided for heating and ventilation. Over-crowding should never be permitted and sufficient free space in each place of lodging should be allowed for the men to gather. Fortunately cots and straw mattresses have everywhere replaced the loose straw which in the early days of the war had to serve for bedding even in the rest billets. Of the types of field barracks, the author considers the *baraques Adrian* the best. Such a barracks may accomodate 120 men with plenty of space for eating and lounging The *foyers de soldats*, the Union Franco-Américaine, etc., are of great value in providing other facilities and means of recreation.

Special care is needed in the proper installation of kitchens, even if they are only the rolling kitchens of campaign use. The ground should be paved or covered with cement to permit of cleaning, and proper means of drainage provided.

Another improvement made in the cantonments is the installation of well-kept infirmaries. A delousing chamber for disinfesta-

tion by sulphur and a bathing establishment for the treatment of skin diseases are necessary additions.

Personal sanitation has been greatly improved by the installation of shower-baths in most of the camps and cantonments. Bathing is required once a week, but a shower may be taken at any time. A laundry should be added to the bathing establishments to provide a change of underclothes after each weekly bath.

Sections d'hygiène corporelle instituted in August 1917, provide these improvements in each army. Forty men may be bathed at the same time, and their clothing disinfected in a steam chamber. The *camions-douches automobiles* which were previously used, serve the same purpose.

The bath alone does not suffice to maintain a sanitary bodily condition. There should also be arrangements permitting the men to wash twice daily. Provision should also be made for the men to wash out articles of clothing which are not received with the regulation garments at the army laundries.

The *water supply* is the object of greatest concern. Bacteriological examination is indispensable. In most places there is an abundant water supply, but it is often in such form as to be easily contaminated. Every precaution should be taken to prevent infiltration of filth. No garbage, manure, latrines, etc., should be allowed in the vicinity. The army water service makes all necessary arrangements in advance. Pumps are installed when possible to prevent the use of dirty dippers.

Javellization is resorted to when necessary. The greatest care must be exercised in employing this method. Water so treated in casks may be easily recontaminated. It is often objectionable in taste, and for every reason is less desirable than water not so treated.

Water procured at a distance should, when possible, be conveyed in pipes or canals and not in barrels, which are a frequent source of infection.

A considerable and efficient sanitary corps has grown up to meet the war needs, and the army physicians devote much of their attention to the same ends. The author expresses the hope that this branch of the service may be still greatly increased and that its good effects may be extended to times of peace.

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